

# ABSOLUTE PRESSURE TRANSMITTER

## DATA SHEET

**FKA...4**

The FCX-AII absolute pressure transmitter accurately measures absolute pressure and transmits a proportional 4 to 20mA signal.

The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

## FEATURES

### 1. High accuracy

0.2% accuracy for all calibrated spans is a standard feature for all AP models covering 1.6kPa{0.016bar} range to 3000kPa{30bar} high pressure range. 0.1% accuracy is available as option. Fuji's micro-capacitance silicon sensor assures this accuracy for all suppressed calibration ranges without additional adjustment.

### 2. Minimum environmental influence

The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, and overpressure substantially reduces total measurement error in actual field applications.

### 3. Fuji/HART® bilingual communications protocol and FOUNDATION™ fieldbus and Profibus™ compatibility

FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII. Further, by upgrading electronics FOUNDATION™ fieldbus and Profibus™ are also available.

### 4. Application flexibility

Various options that render the FCX-AII suitable for almost any process applications include:

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5-digit LCD meter with engineering unit
- Stainless steel electronics housing
- Wide selection of materials

### 5. Burnout current flexibility (Under Scale: 3.2 to 3.8mA, Over Scale: 20.8 to 21.6mA)

Burnout signal level is adjustable using Model FXW Hand Held Communicator (HHC) to comply with NAMUR NE43.

### 6. Dry calibration without reference pressure

Thanks to the best combination of unique construction of mechanical parts (Sensor unit) and high performance electronics circuit (Electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.



## SPECIFICATIONS

### Functional specifications

**Service:** Liquid, gas, or vapour

**Span, range, and overrange limit:**

Type	Span limit [kPa abs] [bar abs]		Range limit [kPa abs] [bar abs]	Overrange limit [MPa] [bar]
	Min.	Max.		
FKA□01	1.6 {0.016}	16 {0.16}	0 to +16 {0 to +0.16}	0.5 {5}
FKA□02	1.6 {0.016}	130 {1.3}	0 to +130 {0 to +1.3}	0.5 {5}
FKA□03	5 {0.05}	500 {5}	0 to +500 {0 to +5}	1.5 {15}
FKA□04	30 {0.3}	3000 {30}	0 to +3000 {0 to +30}	9 {90}

Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

- The maximum span of each sensor can be converted to different units using factors as below.

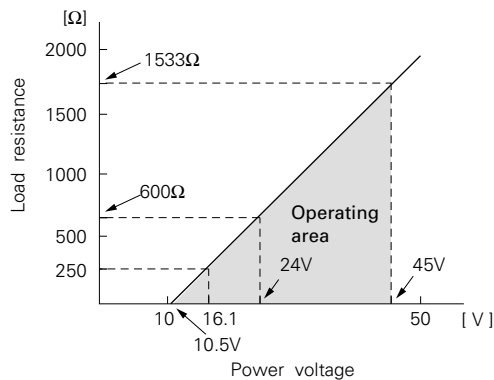
$$1\text{MPa abs} = 10^3\text{kPa abs} = 10\text{bar abs} = 10.19716\text{kgf/cm}^2\text{ abs} = 145.0377\text{psi abs}$$

$$1\text{kPa abs} = 10\text{mbar abs} = 101.9716\text{mmHg abs} = 4.01463\text{inHg abs} = 7.50062\text{mmHg abs}$$

**Output signal:** 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

**Power supply:** Transmitter operates on 10.5V to 45V DC at transmitter terminals.  
10.5V to 32V DC for the units with optional arrester.

Load limitations: see figure below



Note: For communication with HHC<sup>(1)</sup> (Model: FXW), min. of 250Ω is required.

#### Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6	Ex II 1 GD - EExia IIC T4/T5	Ex II 3 GD - EExn IIC T4/T5
Factory Mutual	Class I II III Div. 1	Class I II III Div. 1	Class I II III Div. 2
CSA	Groups B thru. G Class I II III Div. 1	Groups A thru. F Class I II III Div. 1	Groups A thru. G Class I II III Div. 2
RIIS	Groups C thru. G Ex do IIB+H <sub>2</sub> T4	Groups A thru. G Ex ia IIC T4	Groups A thru. G —

#### Zero/span adjustment:

Zero and span are adjustable from the HHC<sup>(1)</sup>. Zero is also adjustable externally from the adjustment screw.

#### Damping:

Adjustable from HHC.  
The time constant is adjustable between 0 to 32 seconds.

#### Zero elevation/suppression:

Zero can be elevated within the specified range limit of each sensor model.

#### Normal/reverse action:

Selectable from HHC<sup>(1)</sup>.

#### Indication:

Analog indicator or 5-digit LCD meter, as specified.

#### Burnout direction: Selectable from HHC<sup>(1)</sup>

If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

##### "Output Hold":

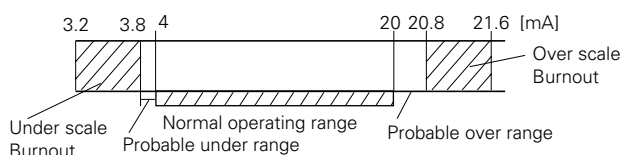
Output signal is hold as the value just before failure happens.

##### "Output Overscale":

Adjustable within the range 20.8mA to 21.6mA from HHC<sup>(1)</sup>

##### "Output Underscale":

Adjustable within the range 3.2mA to 3.8mA from HHC<sup>(1)</sup>



(Note) (1) HHC: Hand Held Communicator

#### Loop-check output:

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC<sup>(1)</sup>.

#### Temperature limit:

Ambient: -40 to +85°C

(-20 to +80°C for LCD indicator)

(-40 to +60°C for arrester option)

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

Process: -40 to +85°C for silicone fill sensor

Storage: -40 to +90°C

#### Humidity limit:

0 to 100% RH

#### Communication:

With HHC<sup>(1)</sup> (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note: HHC's version must be more than 6.0 (or FXW□□□□1-□3), for FCX-A II.

Items	Display	Set
Tag No.	✓	✓
Model No.	✓	✓
Serial No.	✓	—
Engineering unit	✓	✓
Range limit	✓	—
Measuring range	✓	✓
Damping	✓	✓
Output mode	✓	—
Burnout direction	✓	✓
Calibration	✓	✓
Output adjust	—	✓
Data	✓	—
Self diagnoses	✓	—
Printer	—	—
External switch lock	✓	✓
Transmitter display	✓	✓
Linearize	✓	✓
Rerange	✓	✓

### Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode.

#### Accuracy rating: (including linearity, hysteresis, and repeatability).

(Standard)

For spans greater than 1/10 of URL: ±0.2% of span

For spans below 1/10 of URL:

$$\pm \left( 0.1 + 0.1 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

(Option) (code: 21th digit H)

(Not available for Max span 16kPa abs, 130kPa abs)

For spans greater than 1/10 of URL: ±0.1% of span

For spans below 1/10 of URL:

$$\pm \left( 0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

**Stability:**  $\pm 0.2\%$  of upper range limit (URL) for 3 years

**Temperature effect:**  
 Effect per 28°C change between the limits of -40°C and +85°C  
 Zero shift:  $\pm \left( 0.125 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$   
 Total effect:  $\pm \left( 0.15 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$

**Overrange effect:** Zero shift;  $\pm 0.2\%$  of URL for any overrange to maximum limit

**Supply voltage effect:**  
 Less than 0.005% of calibrated span per 1V

**RFI effect:** Less than 0.2% of URL for the frequencies of 20 to 1000MHz and field strength 30V/m when electronics covers on.  
 (Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

**Step response:** Time constant: 0.2 s\*)  
 Dead time: 0.2 s\*)  
 (without electrical damping)  
 \*) Faster response is available as option (maximum update rate: 25 times per second).

**Mounting position effect:**  
 Zero shift, less than 0.1kPa(1mbar) for a 10° tilt in any plane.  
 No effect on span. This error can be corrected by adjusting zero.

**Dielectric strength:**  
 500V AC, 50/60Hz 1 min., between circuit and earth.

**Insulation resistance:**  
 More than 100MΩ at 500V DC.

**Turn-on time:** 4 sec

**Internal resistance for external field indicator:**  
 12Ω or less

## Physical specifications

**Electrical connections:**  
 G1/2, 1/2-14NPT, Pg13.5, or M20 x 1.5 conduit, as specified.  
 1-port (standard) or 2-port with each conduit, as specified.

**Process connections:**  
 1/4-18 NPT or Rc1/4 on 54mm centers, as specified.

### Process-wetted parts material:

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel	316L stainless steel	316 stainless steel	316 stainless steel
H	316 stainless steel	Hastelloy-C	Hastelloy-C lining	316 stainless steel
M	316 stainless steel	Monel	Monel lining	316 stainless steel
T	316 stainless steel	Tantalum	Tantalum lining	316 stainless steel

Notes: Sensor O-rings: Viton  
 Availability of above material design depends on ranges. Refer to "Code symbols".

### Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.  
 Bolts and nut: Cr-Mo alloy (standard) or 304 stainless steel  
 Fill fluid: Silicone oil  
 Mounting bracket: 304 stainless steel.

### Environmental protection:

IEC IP67 and NEMA 6/6P

**Mounting:** On 60.5mm (JIS 50A) pipe using mounting bracket, direct wall mounting, or direct process mounting.

**Mass{weight}:** Transmitter approximately 3.4kg without options.  
 Add; 0.5kg for mounting bracket  
 0.8kg for indicator option  
 4.5kg for stainless steel housing option

## Optional features

**Indicator:** A plug-in analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing. An optional 5-digit LCD meter with engineering unit is also available.

**Arrester:** A built-in arrester protects the electronics from lightning surges.  
 Lightning surge immunity:  
 4kV (1.2 × 50μs)

**Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

**NACE specification:**  
 Metallic materials for all pressure boundary parts comply with NACE MR-01-75. 304 stainless steel bolts and nuts, ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.

**Optional tagplate:**  
 An extra stainless steel tag for customer tag data is wired to the transmitter.

**Coating of cell:** Cell's surface is finished with epoxy/polyurethane double coating. Specify if environment is extremely corrosive.

## ACCESSORIES

**Oval flanges:** (Model FFP, refer to Data Sheet No. EDS6-10)  
 Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 stainless steel.

**Hand held communicator:**  
 (Model FXW, refer to Data Sheet No.EDS 8-47)

**FOUNDATION™ fieldbus and Profibus™:**  
 (Model FDA, refer to Data Sheet No.EDSX 5-85)

# CODE SYMBOLS

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21	← Digit No. of code
4	<Connections> Process connection      Oval flange screw      Conduit connection		F	K	A	0				4									
	Rc1/4      7/16-20UNF      G1/2 (×1)						A												
	1/4-18NPT      7/16-20UNF      1/2-14NPT (×1)						B												
	1/4-18NPT      M10      Pg 13.5 (×1)						C												
	1/4-18NPT      M10      M20×1.5 (×1)						D												
	1/4-18NPT      7/16-20UNF      Pg 13.5 (×1)						E												
	Rc1/4      7/16-20UNF      G1/2 (×2)						S												
	1/4-18NPT      7/16-20UNF      1/2-14NPT (×2)						T												
	1/4-18NPT      M10      Pg 13.5 (×2)						V												
	1/4-18NPT      M10      M20×1.5 (×2)						W												
	1/4-18NPT      7/16-20UNF      Pg 13.5 (×2)						X												
6, 7	<Span limit> Span limit      Process cover      Diaphragm      Wetted cell body	Note1																	
	1.6...16 {0.016...0.16}	316 stainless steel      316L stainless steel      316 stainless steel									1V								
		316 stainless steel      Hast. C      Hast. C lining									1H								
		316 stainless steel      Monel      Monel lining									1M								
	1.6...130 {0.016...1.3}	316 stainless steel      316L stainless steel      316 stainless steel									2V								
		316 stainless steel      Hast. C      Hast. C lining									2H								
		316 stainless steel      Monel      Monel lining									2M								
		316 stainless steel      Tantalum      Tantalum lining									2T								
	5...500 {0.05...5}	316 stainless steel      316L stainless steel      316 stainless steel									3V								
		316 stainless steel      Hast. C      Hast. C lining									3H								
		316 stainless steel      Monel      Monel lining									3M								
		316 stainless steel      Tantalum      Tantalum lining									3T								
	30...3000 {0.3...30}	316 stainless steel      316L stainless steel      316 stainless steel									4V								
		316 stainless steel      Hast. C      Hast. C lining									4H								
		316 stainless steel      Monel      Monel lining									4M								
		316 stainless steel      Tantalum      Tantalum lining									4T								
9	<Indicator and arrester> Indicator      Arrester																		
	None      None										A								
	Analog, 0 to 100% linear scale      None										B								
	Analog, custom scale      None										D								
	None      Yes										E								
	Analog, 0 to 100% linear scale      Yes										F								
	Analog, custom scale      Yes										H								
	Digital, 0 to 100%      None										L								
	Digital, custom scale      None										P								
	Digital, 0 to 100%      Yes										Q								
	Digital, custom scale      Yes										S								
10	<Approvals for hazardous locations (Approval pending)> None (for ordinary locations)																		
	RIIS, Flameproof (Conduit seal)      (Available for 4th digit code "A", "S")										A								
	RIIS, Flameproof (Cable gland seal)      (Available for 4th digit code "A", "S")										B								
	FM, Flameproof (or explosionproof)      (Available for 4th digit code "S", "T")										C								
	CSA, Flameproof (or explosionproof)      (Available for 4th digit code "S", "T")										D								
	ATEX, Flameproof										E								
	RIIS, Intrinsic safety										X								
	FM, Intrinsic safety and nonincendive										G								
	CSA, Intrinsic safety and nonincendive										H								
	ATEX, Intrinsic safety										J								
	ATEX, Type n										K								
											P								
11	<Vent/ drain and mounting bracket> Vent/drain      Mounting bracket																		
	Standard      None																		
	Standard      Yes, stainless steel																		
	Side      None																		
	Side      Yes, stainless steel																		
12	<Options> Extra SS tag plate      Stainless steel elec. housing      Coating of cell																		
	None      None      None																		
	Yes      None      None																		
	None      Yes      None																		
	Yes      Yes      None																		
	None      None      Yes	Note2																	
	Yes      None      Yes																		
	None      Yes      Yes																		
	Yes      Yes      Yes																		

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21	← Digit No. of code
13	<Special applications and fill fluid> Treatment                      Fill fluid Standard                      Silicone oil Degreasing                      Silicone oil NACE specification                      Silicone oil (7th digit code "T" and 15th digit code "A", "B" are not available)		F	K	A	0			4										
14	<Sensor O-ring> Viton																		
15	<Bolt/nut> (*3) Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut NACE bolt/nut (ASTM A193 B7M/A194 2HM) NACE bolt/nut (ASTM A320 L7M/A194 2HM) 304 stainless steel bolt/304 stainless steel nut	Note 3																	
21	<Other options> High accuracy type																		

Note1: (\*1) 100: 1 turn down is possible, but should be used at a span greater than 1/40 of the maximum span for better performance.

Note2: (\*2) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

Note3: (\*3) In case of tropical use, select stainless bolts and nuts.

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

EMI (Emission)      EN61326 : 1997  
Class A (standard for Industrial Location)

Frequency range MHz	Limits	Reference standard
30 to 230	40dB (μV/m) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB (μV/m) quasi peak, measured at 10m distance	

EMI (Immunity)      EN61326: 1997  
Annex A (standard for Industrial Location)

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4kV (Contact) 8kV (Air)	IEC61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	IEC61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	IEC61000-4-8	A
Burst	2kV 5kHz	IEC61000-4-4	A
Surge	1.2μs/50μs 1kV (Line to line) 2kV (Line to ground)	IEC61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	IEC61000-4-6	B

Note) Definition of performance criteria

A: During testing, normal performance within the specification limits.

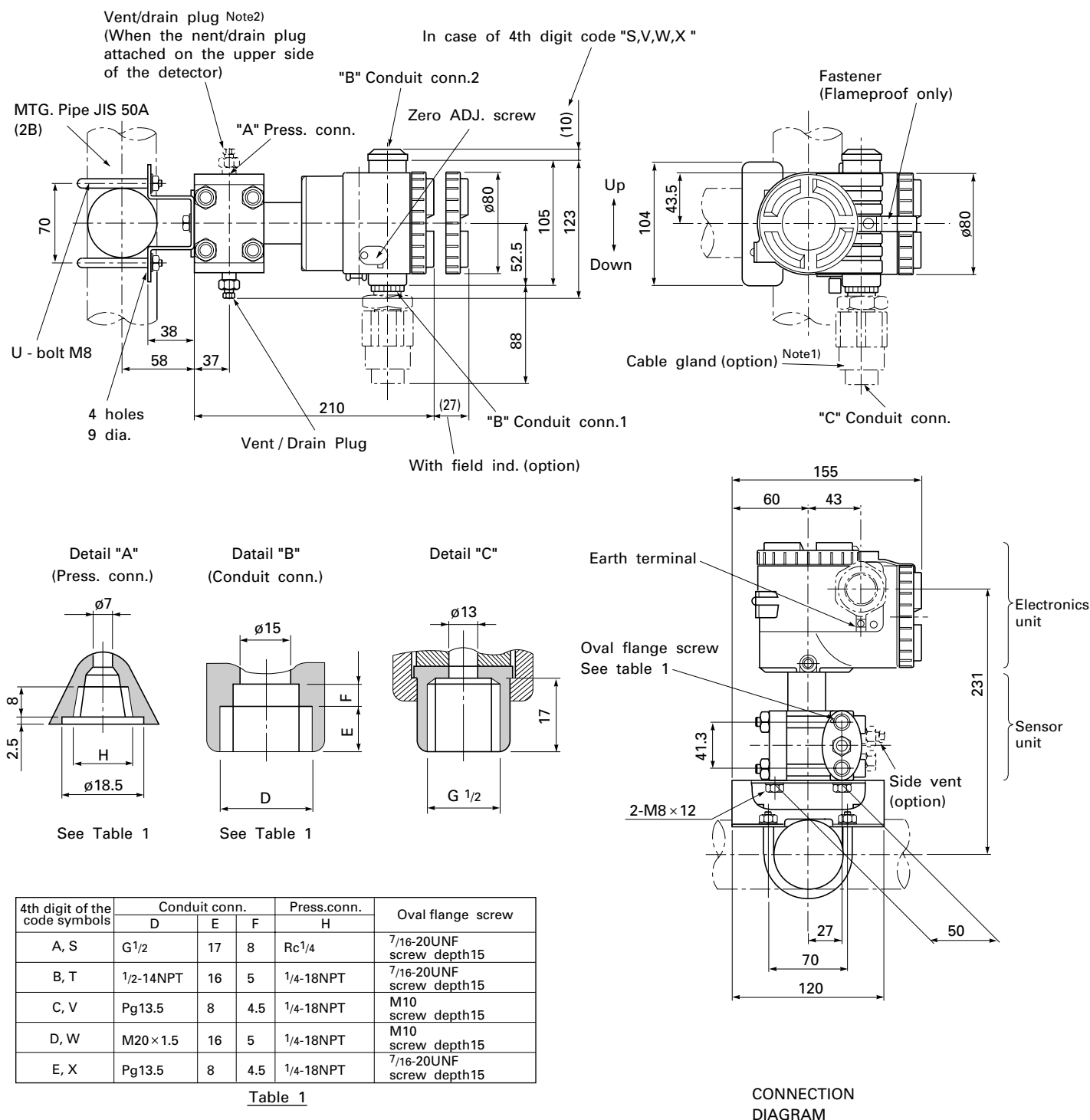
B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

## ORDERING INFORMATION

When ordering this instrument, specify.

1. CODE SYMBOLS
2. Measuring range.
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.  
Hold / Overscale (21.6mA) / Underscale (3.2mA)  
Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
5. Tag No. (up to 26 alphanumeric characters), if required.

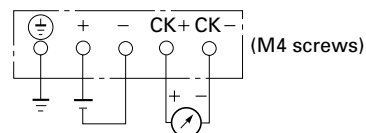
# OUTLINE DIAGRAM (Unit:mm)



Note1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

Note2) The pressure connector is located on the down side surface of the detector, when the vent/drainplug is attached on the upper side of the detector  
(When the 21th digit of the code symbols : C).

## CONNECTION DIAGRAM



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**Fuji Electric Instruments Co.,Ltd.**

### Sales Div.

#### International Sales Dept.

No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan  
Phone: 81-42-585-6201, 6202  
Fax: 81-42-585-6187  
http://www.fic-net.co.jp

# PRESSURE TRANSMITTER

## DATA SHEET

**FKG...4**

The FCX-AII pressure transmitter accurately measures gauge pressure and transmits a proportional 4 to 20mA signal.

The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

## FEATURES

- High accuracy  $\pm 0.07\%$**   
0.07% accuracy is a standard feature. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.
- Minimum environmental influence**  
The "Advance Floating Cell" design which protects the pressure sensor against changes in temperature, and overpressure substantially reduces total measurement error in actual field applications.
- Fuji/HART® bilingual communications protocol and FOUNDATION™ fieldbus and Profibus™ compatibility**  
FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII. Further, by upgrading electronics FOUNDATION™ fieldbus and Profibus™ are also available.
- Application flexibility**  
Various options that render the FCX-AII suitable for almost any process applications include:
  - Analog indicator at either the electronics side or terminal side
  - Full range of hazardous area approvals
  - Built-in RFI filter and lightning arrester
  - 5-digit LCD meter with engineering unit
  - Stainless steel electronics housing
- Burnout current flexibility (Under Scale: 3.2 to 3.8mA, Over Scale: 20.8 to 21.6mA)**  
Burnout signal level is adjustable using Model FXW Hand Held Communicator (HHC) to comply with NAMUR NE43.
- Dry calibration without reference pressure**  
Thanks to the best combination of unique construction of mechanical parts (Sensor unit) and high performance electronics circuit (Electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.



## SPECIFICATIONS

### Functional specifications

**Service:** Liquid, gas, or vapour  
**Span, range and overrange limit:**

Type	Span limit [kPa] [bar]		Range limit [kPa] [bar]		Overrange limit [MPa] [bar]
	Min.	Max.	Lower limit	Upper limit	
FKG□01	1.3 {0.013}	130 {13}	-100 {-1}	130 {0.13}	1 {10}
FKG□02	5 {0.05}	500 {5}	-100 {-1}	500 {5}	1.5 {15}
FKG□03	30 {0.3}	3000 {30}	-100 {-1}	3000 {30}	9 {90}
FKG□04	100 {1}	10000 {100}	-100 {-1}	10000 {100}	15 {150}
FKG□05	500 {5}	50000 {500}	-100 {-1}	50000 {500}	75 {750}

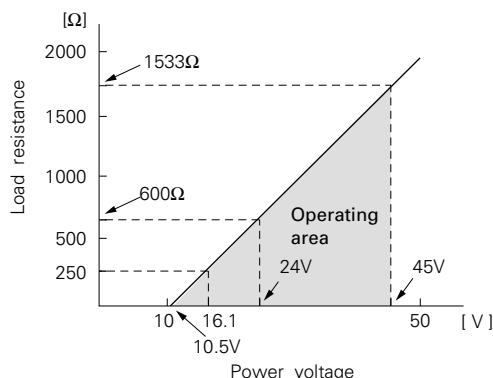
Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

- Lower range limit (vacuum limit) ;  
Silicone fill sensor: See Fig. 1  
Fluorinated fill sensor: 66kPa abs (500mmHg abs) at below 60°C
- Conversion factors to different units;  
1 MPa=10<sup>3</sup> kPa=10bar=10.19716kgf/cm<sup>2</sup>= 145.0377psi  
1 kPa=10mbar=101.9716mmH<sub>2</sub>O =4.01463inH<sub>2</sub>O

**Output signal:** 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

**Power supply:** Transmitter operates on 10.5V to 45V DC at transmitter terminals.  
10.5V to 32V DC for the units with optional arrester.

**Load limitations:** see figure below



Note: For communication with HHC<sup>(1)</sup> (Model: FXW), min. of 250 Ω required.

#### Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6 Class I II III Div. 1	Ex II 1 GD - EExia IIC T4/T5 Class I II III Div. 1	Ex II 3 GD - EExn IIC T4/T5 Class I II III Div. 2
Factory Mutual	Groups B thru. G Class I II III Div. 1	Groups A thru. F Class I II III Div. 1	Groups A thru. G Class I II III Div. 2
CSA	Groups C thru. G Ex do IIB+H <sub>2</sub> T4	Groups A thru. G Ex ia II C T4	Groups A thru. G —
RIIS			

#### Zero/span adjustment:

Zero and span are adjustable from the HHC<sup>(1)</sup>. Zero is also adjustable externally from the adjustment screw.

#### Damping:

Adjustable from HHC.  
The time constant is adjustable between 0 to 32 seconds.

#### Zero elevation/suppression:

Zero can be elevated or suppressed within the specified range limit of each sensor model.

#### Normal/reverse action:

Selectable from HHC<sup>(1)</sup>.

#### Indication:

Analog indicator or 5-digit LCD meter, as specified.

#### Burnout direction: Selectable from HHC<sup>(1)</sup>

If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

##### "Output Hold":

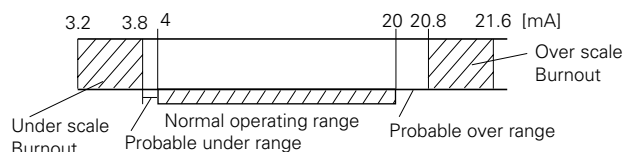
Output signal is hold as the value just before failure happens.

##### "Output Overscale":

Adjustable within the range 20.8mA to 21.6mA from HHC<sup>(1)</sup>

#### "Output Underscale":

Adjustable within the range 3.2mA to 3.8mA from HHC



(Note) (1) HHC: Hand Held Communicator

#### Loop-check output:

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC.

#### Temperature limit:

Ambient: -40 to +85°C

(-20 to +80°C for LCD indicator)

(-40 to +60°C for arrester option)

(-10 to +60°C for fluorinated oil fill transmitter)

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

Process: -40 to +100°C for silicone fill sensor

-20 to +80°C for fluorinated oil fill sensor

Storage: -40 to +90°C

0 to 100% RH

#### Humidity limit:

**Communication:** With HHC<sup>(1)</sup> (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note: HHC's version must be more than 6.0 (or FXW□□□1-□3), for FCX-A II.

Items	Display	Set
Tag No.	✓	✓
Model No.	✓	✓
Serial No.	✓	—
Engineering unit	✓	✓
Range limit	✓	—
Measuring range	✓	✓
Damping	✓	✓
Output mode	✓	—
Burnout direction	✓	✓
Calibration	✓	✓
Output adjust	—	✓
Data	✓	—
Self diagnoses	✓	—
Printer	—	—
External switch lock	✓	✓
Transmitter display	✓	✓
Linearize	✓	✓
Rerange	✓	✓

## Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode.

**Accuracy rating:** (including linearity, hysteresis, and repeatability)

### Max span below 10000kPa model:

For spans greater than 1/10 of URL:  $\pm 0.07\%$  of span

For spans below 1/10 of URL:

$$\pm \left( 0.02 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

### Max span 50000kPa model:

For spans greater than 1/10 of URL:  $\pm 0.1\%$  of span

For spans below 1/10 of URL:

$$\pm \left( 0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

**Stability:**  $\pm 0.1\%$  of upper range limit (URL) for 3 years

### Temperature effect:

Effects per 28°C change between the limits of -40°C and +85°C

$$\text{Zero shift: } \pm (0.075 + 0.0125 \frac{\text{URL}}{\text{span}}) \%$$

$$\text{Total effect: } \pm (0.095 + 0.0125 \frac{\text{URL}}{\text{span}}) \%$$

**Overrange effect:** Zero shift; 0.2% of URL for any overrange to maximum limit

### Supply voltage effect:

Less than 0.005% of calibrated span per 1V

**RFI effect:** Less than 0.2% of URL for the frequencies of 20 to 1000MHz and field strength 30 V/m when electronics covers on.  
(Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

**Step response:** Time constant: 0.2s \*)  
Dead time: approximately 0.2s \*)  
(without electrical damping)  
) Faster response is available as option  
(maximum update rate: 25 times per second).

### Mounting position effect:

Zero shift, less than 0.1kPa {1m bar} for a 10° tilt in any plane.

No effect on span. This error can be corrected by adjusting Zero.

### Dielectric strength:

500V AC, 50/60Hz 1 min., between circuit and earth.

### Insulation resistance:

More than 100MΩ at 500V DC.

### Turn-on time:

4 sec.

### Internal resistance for external field indicator:

12Ω or less

## Physical specifications

### Electrical connections:

G1/2, 1/2-14 NPT, Pg13.5, or M20 × 1.5 conduit, as specified.

1-port (standard) or 2-port with each conduit, as specified.

### Process connections:

1/4-18 NPT or Rc1/4 on 54mm centers, as specified.

Meet DIN 19213

### Process-wetted parts material:

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel(*)	316L stainless steel	316 stainless steel	316 stainless steel
J	316 stainless steel(*)	316L stainless steel	316 stainless steel	316 stainless steel
H	316 stainless steel(*)	+Au coating Hastelloy-C	Hastelloy-C lining	316 stainless steel
M	316 stainless steel(*)	Monel	Monel lining	316 stainless steel
T	316 stainless steel(*)	Tantalum	Tantalum lining	316 stainless steel
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum lining	Tantalum	Tantalum lining	Hastelloy-C

Note: \*(1) SCS14 per JIS G 5121

Remark: Sensor O-rings: Viton O-ring and teflon gasket selectable  
Availability of above material design depends on ranges. Refer to "Code symbols".

### Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.

Bolts and nuts: Cr-Mo alloy (standard), or 304 stainless steel (630 stainless steel for 50MPa unit).

Fill fluid: Silicone oil (standard) or fluorinated oil

Mounting bracket: 304 stainless steel

### Environmental protection:

IEC IP67 and NEMA 6/6P

### Mounting:

On 60.5mm (JIS 50A) pipe using mounting bracket, direct wall mounting, or direct process mounting.

### Mass {weight}:

Transmitter approximately 3.4kg without options.

Add; 0.5kg for mounting bracket

0.8kg for indicator option

4.5kg for stainless steel housing option

## Optional features

- Indicator:** A plug-in analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.  
An optional 5-digit LCD meter with engineering unit is also available.
- Arrester:** A built-in arrester protects the electronics from lightning surges.  
Lightning surge immunity:  
4kV ( $1.2 \times 50\mu\text{s}$ )
- Oxygen service:** Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.  
The fill fluid is fluorinated oil.
- Chlorine service:** The fill fluid is fluorinated oil.
- Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.
- NACE specification:** Metallic materials for all pressure boundary parts comply with NACE MR-01-75. ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.
- Vacuum service:** Special silicone oil and filling procedure are applied.  
See Fig.1.
- Optional tag plate:** An extra stainless steel tag with customer tag data is wired to the transmitter.
- Coating of cell:** Cell's surface is finished with epoxy/polyurethane double coating. Specify if environment is extremely corrosive.

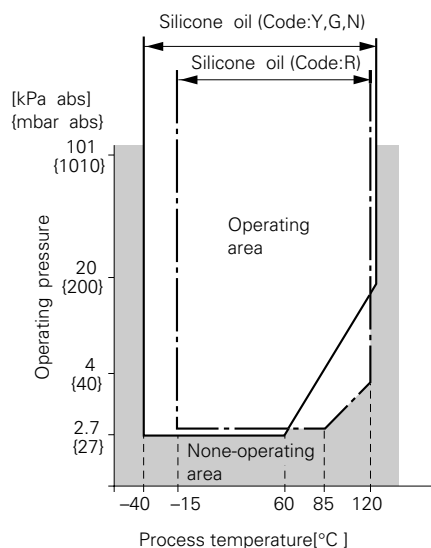


Fig. 1 Relation between process temperature and operating pressure

## ACCESSORIES

- Oval flanges:** (Model FFP, refer to Data Sheet No. EDS6-10)  
Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 stainless steel.
- Hand-held communicator:** (Model FXW, refer to Data Sheet No. EDS8-47)
- FOUNDATION™ fieldbus and Profibus™:** (Model FDG, refer to Data Sheet No. EDSX5-85)

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

**EMI (Emission) EN61326 : 1997**  
**Class A (standard for Industrial Location)**

Frequency range MHz	Limits	Reference standard
30 to 230	40dB (μV/m) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB (μV/m) quasi peak, measured at 10m distance	

**EMI (Immunity) EN61326: 1997**  
**Annex A (standard for Industrial Location)**

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4kV (Contact) 8kV (Air)	IEC61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	IEC61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	IEC61000-4-8	A
Burst	2kV 5kHz	IEC61000-4-4	A
Surge	1.2μs/50μs 1kV (Line to line) 2kV (Line to ground)	IEC61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	IEC61000-4-6	B

**Note) Definition of performance criteria**

**A:** During testing, normal performance within the specification limits.

**B:** During testing, temporary degradation, or loss of function or performance which is self-recovering.

# CODE SYMBOLS

Digit	Description			Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	← Digit No. of code
4	<Connections>				F	K	G		0			4								
	Process connection	Oval flange screw	Conduit connection																	
	Rc1/4	7/16-20UNF	G1/2 (×1)																	
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×1)																	
	1/4-18NPT	M10 (or M12)(*1)	Pg13.5 (×1)	Note 1																
	1/4-18NPT	M10 (or M12)(*1)	M20×1.5 (×1)	Note 1																
	1/4-18NPT	7/16-20UNF	Pg13.5 (×1)																	
	Rc1/4	7/16-20UNF	G1/2 (×2)																	
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×2)																	
	1/4-18NPT	M10 (or M12)(*1)	Pg13.5 (×2)	Note 1																
	1/4-18NPT	M10 (or M12)(*1)	M20×1.5 (×2)	Note 1																
	1/4-18NPT	7/16-20UNF	Pg13.5 (×2)																	
6, 7	<Span and materials>																			
	Span limit [kPa]{bar}(*2)	Process cover	Diaphragm	Wetted cell body	Note 2															
	1.3...130 {0.013...1.3}	316 stainless steel	316L stainless steel	316 stainless steel									1V							
		316 stainless steel	316L stainless steel +Au coating	316 stainless steel									1J							
		316 stainless steel	Hast. C	Hast. C lining									1H							
		316 stainless steel	Monel	Monel lining									1M							
		316 stainless steel	Tantalum	Tantalum lining									1T							
		Hast. C lining	Hast. C	Hast. C lining									1B							
		Monel lining	Monel	Monel lining									1L							
		Tantalum lining	Tantalum	Tantalum lining									1U							
	5...500 {0.05...5}	316 stainless steel	316L stainless steel	316 stainless steel									2V							
		316 stainless steel	316L stainless steel +Au coating	316 stainless steel									2J							
		316 stainless steel	Hast. C	Hast. C lining									2H							
		316 stainless steel	Monel	Monel lining									2M							
		316 stainless steel	Tantalum	Tantalum lining									2T							
		Hast. C lining	Hast. C	Hast. C lining									2B							
		Monel lining	Monel	Monel lining									2L							
		Tantalum lining	Tantalum	Tantalum lining									2U							
	30...3000 {0.3...30}	316 stainless steel	316L stainless steel	316 stainless steel									3V							
		316 stainless steel	316L stainless steel +Au coating	316 stainless steel									3J							
		316 stainless steel	Hast. C	Hast. C lining									3H							
		316 stainless steel	Monel	Monel lining									3M							
		316 stainless steel	Tantalum	Tantalum lining									3T							
		Hast. C lining	Hast. C	Hast. C lining									3B							
		Monel lining	Monel	Monel lining									3L							
		Tantalum lining	Tantalum	Tantalum lining									3U							
	100...10000 {1...100}	316 stainless steel	316L stainless steel	316 stainless steel									4V							
		316 stainless steel	316L stainless steel +Au coating	316 stainless steel									4J							
		316 stainless steel	Hast. C	Hast. C lining									4H							
		316 stainless steel	Monel	Monel lining									4M							
		316 stainless steel	Tantalum	Tantalum lining									4T							
		Hast. C lining	Hast. C	Hast. C lining									4B							
		Monel lining	Monel	Monel lining									4L							
		Tantalum lining	Tantalum	Tantalum lining									4U							
	500...50000 {5...500}	316 stainless steel	316L stainless steel	316 stainless steel									5V							
9	<Indicator and arrester>																			
	Indicator		Arrester																	
	None		None																	
	Analog, 0 to 100% linear scale		None																	
	Analog, custom scale		None																	
	None		Yes																	
	Analog, 0 to 100% linear scale		Yes																	
	Analog, custom scale		Yes																	
	Digital, 0 to 100%		None																	
	Digital, custom scale		None																	
	Digital, 0 to 100%		Yes																	
	Digital, custom scale	Yes																		

Note 1 : (\*1) For 50MPa {500bar} units, M12 is provided rather than M10.

Note 2 : (\*2) 100: 1 turn down is possible, but should be used at the span greater than 1/40 of the maximum span for better performance.

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Digit No. of code
10	<Approvals for hazardous locations (Approval pending)> None (for ordinary locations) RIIS, Flameproof (Conduit seal) (Available for 4th digit code "A", "S") RIIS, Flameproof (Cable gland seal) (Available for 4th digit code "A", "S") FM, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") CSA, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") ATEX, Flameproof RIIS, Intrinsic safety FM, Intrinsic safety and Nonincendive CSA, Intrinsic safety and Nonincendive ATEX, Intrinsic safety ATEX, Type n		F	K	G	0				4								
11	<Vent/ drain and mounting bracket> Vent/drain Mounting bracket Standard None } Specify "A", or "C" for the 7th Standard Yes, stainless steel } digit code "B", "L", or "U" Side None Side Yes, stainless steel																	
12	<Options> Extra SS tag plate Stainless steel elec. housing Coating of cell None None None Yes None None None Yes None Yes (*3) Yes None None None Yes Yes None Yes None Yes Yes Yes Yes Yes	Note3																
13	<Special applications and fill fluid> Treatment Fill fluid Standard Silicone oil Standard Fluorinated oil Degreasing Silicone oil Oxygen service Fluorinated oil (7th digit code "V" only) Chlorine service Fluorinated oil (7th digit code "H", "T", "B", "U") NACE specification Silicone oil (Not available for 6th digit code "5", 7th digit code "T", "U", 15th digit code "A", "B") Vacuum service Silicone oil for vacuum use																	
14	<Sensor O-ring / Gasket> Viton (O-ring) Teflon (gasket)																	
15	<Bolt/nut> Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut NACE bolt/nut (ASTM A193 B7M/A194 2HM) NACE bolt/nut (ASTM A320 L7M/A194 2HM) 304 stainless steel bolt/304 stainless steel nut 630 stainless steel bolt/304 stainless steel nut	Not available for 6th digit code "5" Available for 6th digit code "5"																

Note 3 : (\*3) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

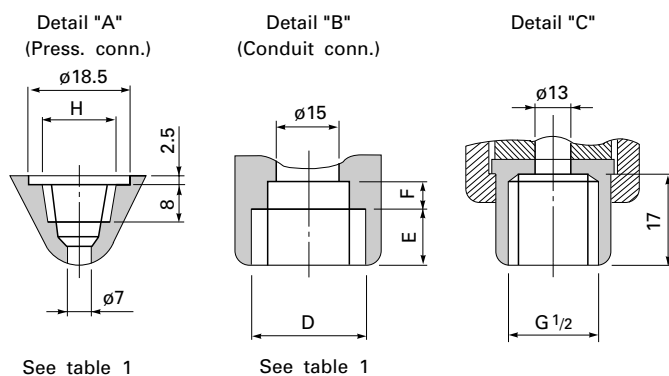
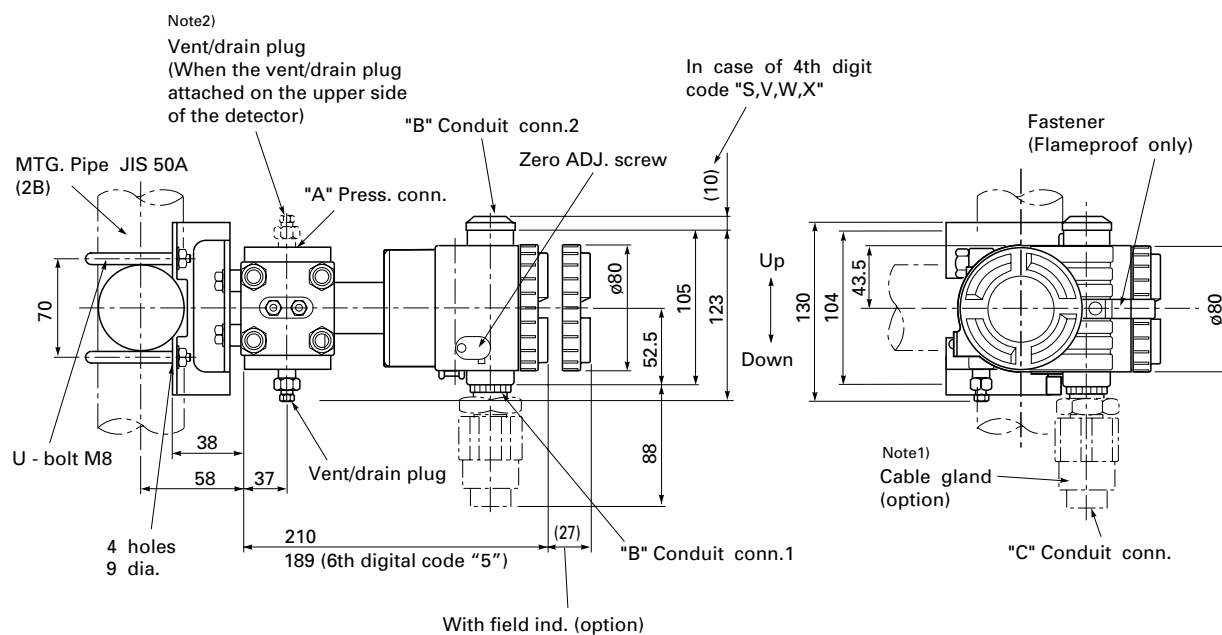
## ORDERING INFORMATION

When ordering this instrument, specify.

1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.  
Hold/Overscale (21.6mA)/Overscale (3.2mA)  
Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D,H,P,S on 9th digit).
5. Tag No.(up to 26 alphanumerical characters), if required.

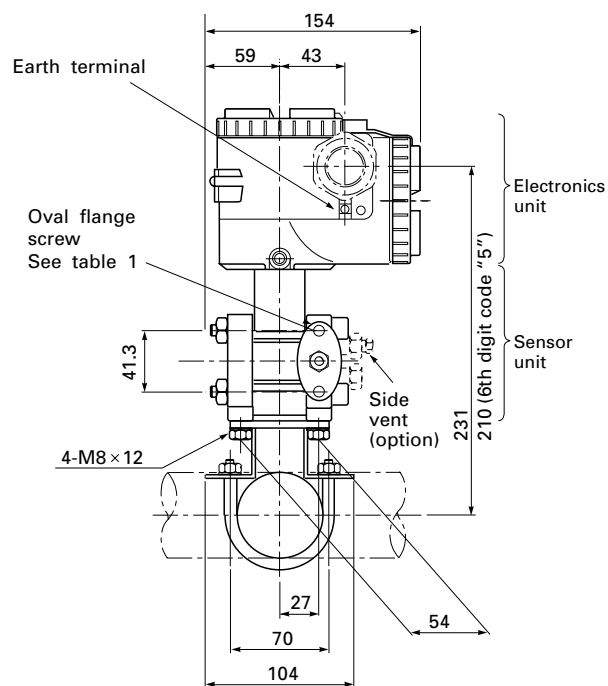
### OUTLINE DIAGRAM (Unit:mm)

< 7th digit code : V, H, M, T >

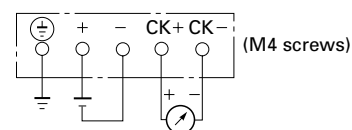


4th digit of the code symbols	Conduit conn.			Press.conn.	Oval flange screw
	D	E	F	H	
A, S	G1/2	17	8	Rc1/4	7/16-20UNF Screw depth15
B, T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF Screw depth15
C, V	Pg13.5	8	4.5	1/4-18NPT	M10 Screw depth15
D, W	M20 x 1.5	16	5	1/4-18NPT	M10 Screw depth15
E, X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF Screw depth15

Table 1



### CONNECTION DIAGRAM



Note1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

Note2) The pressure connector is located on the down side surface of the detector, when the vent/drain plug is attached on the upper side of the detector  
(When the 21th digit of the code symbols : C).

< 7th digit code : B, L, U >

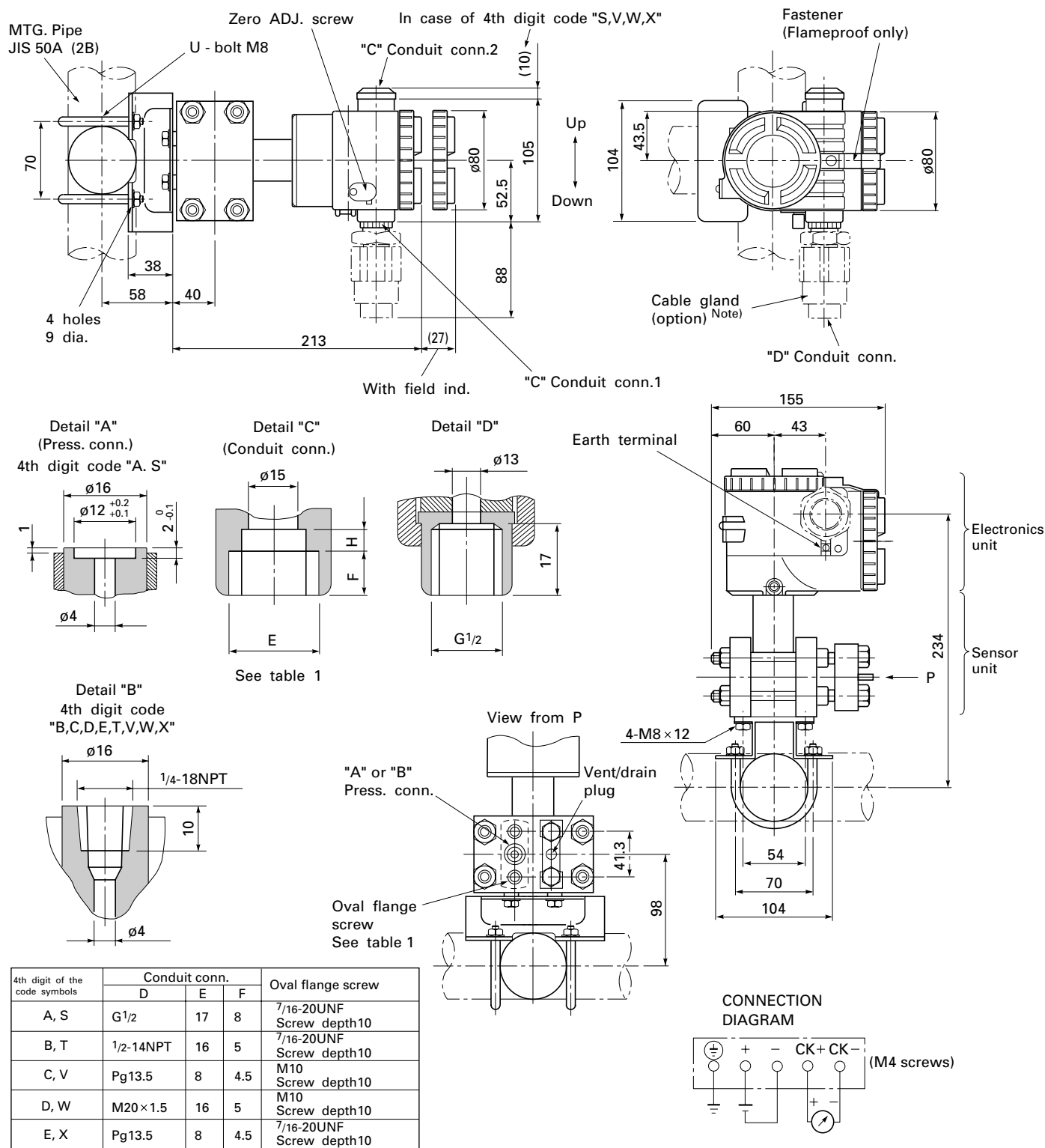


Table 1

Note) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

**Fuji Electric Co.,Ltd.**

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**Fuji Electric Instruments Co.,Ltd.**

**Sales Div.**

**International Sales Dept.**

No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan

Phone: 81-42-585-6201, 6202

Fax: 81-42-585-6187

<http://www.fic-net.co.jp>

# DIFFERENTIAL PRESSURE (FLOW) TRANSMITTER

## DATA SHEET

**FKC...4**

The FCX-AII differential pressure (flow) transmitter accurately measures differential pressure, liquid level, gauge pressure or flow rate and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

## FEATURES

- High accuracy  $\pm 0.07\%$**   
0.07% accuracy is a standard feature.  
Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.
- Minimum environmental influence**  
The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, static pressure, and overpressure substantially reduces total measurement error in actual field applications.
- Fuji/HART® bilingual communications protocol and FOUNDATION™ fieldbus and Profibus™ compatibility**  
FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII. Further, by upgrading electronics FOUNDATION™ fieldbus and Profibus™ are also available.
- Application flexibility**  
Various options that render the FCX-AII suitable for almost any process applications include.
  - Analog indicator at either the electronics side or terminal side
  - Full range of hazardous area approvals
  - Built-in RFI filter and lightning arrester
  - 5-digit LCD meter with engineering unit
  - Stainless steel electronics housing
  - Wide selection of materials
- Programmable output Linearization Function**  
In addition to Linear and Square Root, output signal can be freely programmable.  
(Up to 14 compensated points at approximation.)
- Burnout current flexibility (Under Scale: 3.2 to 3.8mA, Over Scale: 20.8 to 21.6mA)**  
Burnout signal level is adjustable using Model FXW Hand Held Communicator (HHC) to comply with NAMUR NE43.
- Dry calibration without reference pressure**  
Thanks to the best combination of unique construction of mechanical parts (Sensor unit) and high performance electronics circuit (Electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.



## SPECIFICATIONS

### Functional specifications

**Service:** Liquid, gas, or vapour  
**Static pressure, span, and range limit:**

Type	Static pressure [MPa] [bar]	Span limit [kPa] [m bar]		Range limit [kPa] [m bar]
		Min.	Max.	
FKC□11	-0.1 to + 3.2 { -1 to + 32 }	0.1 { 1 }	1 { 10 }	+/- 1 { +/- 10 }
FKC□22	-0.1 to + 10 { -1 to + 100 }	0.1 { 1 }	6 { 60 }	+/- 6 { +/- 60 }
FKC□23	-0.1 to + 10 { -1 to + 100 }	0.32 { 3.2 }	32 { 320 }	+/- 32 { +/- 320 }
FKC□25	-0.1 to + 10 { -1 to + 100 }	1.3 { 13 }	130 { 1300 }	+/- 130 { +/- 1300 }
FKC□26	-0.1 to + 10 { -1 to + 100 }	5 { 50 }	500 { 5000 }	+/- 500 { +/- 5000 }
FKC□33	-0.1 to + 16 { -1 to + 160 }	0.32 { 3.2 }	32 { 320 }	+/- 32 { +/- 320 }
FKC□35	-0.1 to + 16 { -1 to + 160 }	1.3 { 13 }	130 { 1300 }	+/- 130 { +/- 1300 }
FKC□36	-0.1 to + 16 { -1 to + 160 }	5 { 50 }	500 { 5000 }	+/- 500 { +/- 5000 }
FKC□38	-0.1 to + 16 { -1 to + 160 }	30 { 300 }	3000 { 30000 }	+/- 3000 { +/- 30000 }
FKC□43	-0.1 to + 42 { -1 to + 420 }	0.32 { 3.2 }	32 { 320 }	+/- 32 { +/- 320 }
FKC□45	-0.1 to + 42 { -1 to + 420 }	1.3 { 13 }	130 { 1300 }	+/- 130 { +/- 1300 }
FKC□46	-0.1 to + 42 { -1 to + 420 }	5 { 50 }	500 { 5000 }	+/- 500 { +/- 5000 }
FKC□48	-0.1 to + 30 { -1 to + 300 }	30 { 300 }	3000 { 30000 }	+/- 3000 { +/- 30000 }

Remark : To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

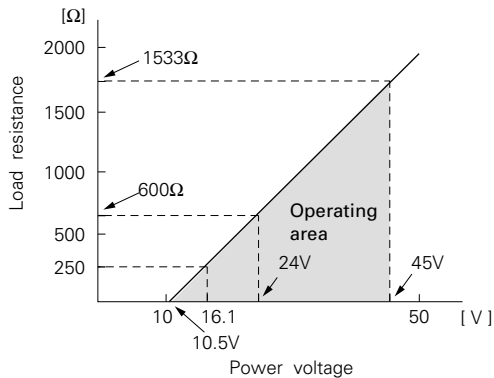
- Lower limit of static pressure (vacuum limit) ;  
Silicone fill sensor: See Fig. 1  
Fluorinated fill sensor: 66kPa abs (500mmHg abs) at temperature below 60°C
- The maximum span of each sensor can be converted to different units using factors as below.  
1MPa = 10<sup>3</sup>KPa = 10bar = 10.19716kgf/cm<sup>2</sup>  
= 145.0377psi  
1kpa = 10mbar = 101.9716mmH<sub>2</sub>O = 4.01463inH<sub>2</sub>O

**Over range limit:** To maximum static pressure limit

**Output signal:** 4 to 20mA DC (linear or square root) with digital signal superimposed on the 4 to 20mA signal

**Power supply:** Transmitter operates on 10.5V to 45V DC at transmitter terminals.  
10.5V to 32V DC for the units with optional arrester.

**Load limitations:** see figure below



Note: For communication with HHC<sup>(1)</sup> (Model: FXW), min. of 250 Ω required.

#### Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6	Ex II 1 GD - EExia IIC T4/T5	Ex II 3 GD - EExn IIC T4/T5
Factory Mutual	Class I II III Div. 1	Class I II III Div. 1	Class I II III Div. 2
CSA	Groups B thru. G Class I II III Div. 1	Groups A thru. F Class I II III Div. 1	Groups A thru. G Class I II III Div. 2
RIIS	Groups C thru. G Ex do IIB+H <sub>2</sub> T4	Groups A thru. G Ex ia IIC T4	Groups A thru. G —

#### Zero/span adjustment:

Zero and span are adjustable from the HHC<sup>(1)</sup>. Zero is also adjustable externally from the adjustment screw.

**Damping:** Adjustable from HHC.

The time constant is adjustable between 0 to 32 seconds.

#### Zero elevation/suppression:

–100% to +100% of URL

#### Normal/reverse action:

Selectable from HHC<sup>(1)</sup>

**Indication:** Analog indicator or 5-digit LCD meter, as specified.

**Burnout direction:** Selectable from HHC<sup>(1)</sup>

If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

"Output Hold":

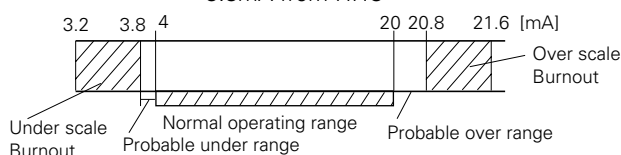
Output signal is hold as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.8mA to 21.6mA from HHC<sup>(1)</sup>

"Output Underscale":

Adjustable within the range 3.2mA to 3.8mA from HHC<sup>(1)</sup>



#### Loop-check output:

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC<sup>(1)</sup>.

#### Temperature limit:

Ambient: –40 to +85°C

(–20 to +80°C for LCD indicator)

(–40 to +60°C for arrester option)

(–10 to +60°C for fluorinated oil filled transmitters)

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified in each standard.

Process: –40 to +120°C for silicone fill sensor

–20 to +80°C for fluorinated oil fill sensor

Storage: –40 to +90°C

**Humidity limit:** 0 to 100% RH

**Communication:** With HHC<sup>(1)</sup> (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note: HHC's version must be more than 6.0 (or FXW □□□□1–□3), for FCX-A II.

Items	Display	Set
Tag No.	✓	✓
Model No.	✓	✓
Serial No.	✓	—
Engineering unit	✓	✓
Range limit	✓	—
Measuring range	✓	✓
Damping	✓	✓
Output mode	Linear	✓
	Square root	✓
Burnout direction	✓	✓
Calibration	✓	✓
Output adjust	—	✓
Data	✓	—
Self diagnoses	✓	—
Printer	—	—
External switch lock	✓	✓
Transmitter display	✓	✓
Linearize	✓	✓
Rerange	✓	✓

#### Programmable output linearization function:

Output signal can be characterized with "14 points linear approximation function" from HHC<sup>(1)</sup>.

## Performance specifications for linear output

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode.

**Accuracy rating:** (including linearity, hysteresis, and repeatability)

### Max span above 32kPa model:

For spans greater than 1/10 of URL:  $\pm 0.07\%$  of span

For spans below 1/10 of URL:

$$\pm \left( 0.02 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

### Max span 1kPa, 6kPa model:

For spans greater than 1/10 of URL:  $\pm 0.1\%$  of span

For spans below 1/10 of URL:

$$\pm \left( 0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

**Stability:**  $\pm 0.1\%$  of upper range limit (URL) for 3 years for 6th digit code 3, 5, 6, 8.

### Temperature effect:

Effects per 28°C change between the limits of -40°C and +85°C

Range code (6th digit in Code symbols)	Zero shift	Total effect
"1"/1kPa {10mbar} max. span "2"/6kPa {60mbar} max. span	$\pm \left( 0.125 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$	$\pm \left( 0.15 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$
"3"/32kPa {320mbar} max. span "5"/130kPa {1300mbar} max. span "6"/500kPa {5000mbar} max. span "8"/3000kPa {30000mbar} max. span	$\pm \left( 0.075 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$	$\pm \left( 0.095 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$

### Static pressure effect:

Static pressure code (5th digit in Code symbols)	Zero shift (% of URL)	Span shift (% of calibrated span)
"1" / 1kPa {10m bar} sensor	$\pm 0.2\% / 1\text{MPa}\{10\text{bar}\}$	$-0.2\% / 3.2\text{MPa}\{32\text{bar}\}$
"2" / 6kPa {60 m bar} sensor	$\pm 0.1\% / 3.2\text{MPa}\{32\text{bar}\}$	$-0.2\% / 3.2\text{MPa}\{32\text{bar}\}$
"2"	$\pm 0.05\% / 10\text{MPa}\{100\text{bar}\}$	$-0.2\% / 10\text{MPa}\{100\text{bar}\}$
"3"		
"4"		

### Overrange effect:

Static pressure code (5th digit in Code symbols)	Zero shift (% of URL)
"1" / 1kPa{10m bar} sensor	$\pm 0.3\% / 1\text{MPa} \{10\text{bar}\}$
"2" / 6kPa{60m bar} sensor	$\pm 0.1\% / 3.2\text{MPa} \{32\text{bar}\}$
"2"	$\pm 0.1\% / 10\text{MPa} \{100\text{bar}\}$
"3"	$\pm 0.1\% / 16\text{MPa} \{160\text{bar}\}$
"4"	$\pm 0.25\% / 42\text{MPa} \{420\text{bar}\}$

## Performance specifications for square root output

### Accuracy rating:

Output	Span	
	over $0.1 \times \text{URL}$	below $0.1 \times \text{URL}$
50 to 100%	$\pm 0.07\%$	$\pm (0.02 + 0.05 \times 0.1 \times \text{URL}/\text{Span})\%$
20 to 50%	$\pm 0.175\%$	$\pm 2.5 \times (0.02 + 0.05 \times 0.1 \times \text{URL}/\text{Span})\%$
10 to 20%	$\pm 0.35\%$	$\pm 5 \times (0.02 + 0.05 \times 0.1 \times \text{URL}/\text{Span})\%$

### Max span 1kPa, 6kPa model:

Output	Accuracy
50 to 100%	$\pm 0.1\%$
20 to 50%	$\pm 0.25\%$
10 to 20%	$\pm 0.5\%$

### Temperature effect:

Effects per 55°C change between the limits of -40°C and +85°C

Range code	Shift at 20% output point
"1" and "2"	$\pm \left( 0.3 + 0.25 \frac{\text{URL}}{\text{Span}} \right) \%/28^\circ\text{C}$
"3" through "8"	$\pm \left( 0.24 + 0.03125 \frac{\text{URL}}{\text{Span}} \right) \%/28^\circ\text{C}$

**Low flow cut-off:** Customer configurable for any point between 7 to 20% of output

### Supply voltage effect:

Less than 0.005% of calibrated span per 1V

### RFI effect:

Less than 0.2% of URL for the frequencies of 20 to 1000MHz and field strength 30 V/m when electronics covers on.  
(Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

### Step response: (without electrical damping)

Range code (6th digit in code symbols)	Time constant*)	Dead time*)
"1"	0.8 s	0.2 s
"2"	0.5 s	
"3"	0.3 s	
"5" through "8"	0.2 s	

\*) Faster response is available as option (maximum update rate: 25 times per second).

### Mounting position effect:

Zero shift, less than 0.12kPa {1.2m bar} for a 10° tilt in any plane.

No effect on span.

This error can be corrected by adjusting Zero.

### Dielectric strength:

500V AC, 50/60Hz 1 min., between circuit and earth.

### Insulation resistance:

More than 100MΩ at 500V DC.

### Turn-on time:

4 sec.

### Internal resistance for external field indicator:

12Ω or less

## Physical specifications

## Electrical connections:

G1/2, 1/2-14 NPT, Pg13.5, or M20 × 1.5 conduit, as specified.

And 1 conduit or 2 conduits, as specified.

## Process connections:

1/4-18 NPT or Rc1/4 on 54mm centers, as specified.

Meets DIN 19213.

## Process-wetted parts material:

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel(*1)	316L stainless steel	316 stainless steel	316 stainless steel
H	316 stainless steel(*1)	Hastelloy-C	Hastelloy-C lining	316 stainless steel
J	316 stainless steel(*1)	316L stainless steel +Au coating	316 stainless steel	316 stainless steel
M	316 stainless steel(*1)	Monel	Monel lining	316 stainless steel
T	316 stainless steel(*1)	Tantalum	Tantalum lining	316 stainless steel
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum lining	Tantalum	Tantalum lining	Hastelloy-C

Notes: \* (1) SCS14 per JIS G 5121

Remark: Sensor O-rings: Viton O-ring and teflon gasket selectable.

Availability of above material design depends on ranges and static pressure. Refer to "Code symbols".

## Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.

Bolts and nuts: Cr-Mo alloy (standard), 304 stainless steel (for static pressure code "1", "2", and "3" only), or 630 stainless steel (for static pressure code "3" and "4" only). Static pressure rating for code "3" with 304 stainless steel bolts is degraded to 10MPa.

Fill fluid: Silicone oil (standard) or fluorinated oil

Mounting bracket: 304 stainless steel

## Environmental protection:

IEC IP67 and NEMA 6/6P

## Mounting:

On 60.5mm(JIS 50A) pipe using mounting bracket, direct wall mounting, or direct process mounting.

## Mass(weight):

Transmitter approximately 4.4kg without options.

Add; 0.5kg for mounting bracket

0.8kg for indicator option

4.5kg for stainless steel housing option

## Optional features

## Indicator:

A plug-in analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.

An optional 5-digit LCD meter with engineering unit is also available.

## Arrester:

A built-in arrester protects the electronics from lightning surges.

Lightning surge immunity:

4kV (1.2 × 50μs)

## Oxygen service:

Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.

The fill fluid is fluorinated oil.

## Chlorine service:

The fill fluid is fluorinated oil.

## Degreasing:

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

## NACE specification:

Metallic materials for all pressure boundary parts comply with NACE MR-01-75. ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.

Static pressure rating for code "3" (16 MPa) is degraded to 10MPa.

## Vacuum service:

Special silicone oil and filling procedure are applied.

See Fig. 1.

## Optional tag plate:

An extra stainless steel tag with customer tag data is wired to the transmitter.

## Coating of cell:

Cell's surface is finished with epoxy/polyurethane double coating. Specify if environment is extremely corrosive.

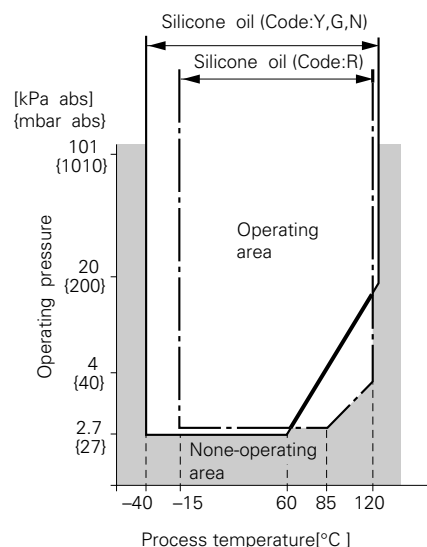


Fig. 1 Relation between process temperature and operating pressure

## ACCESSORIES

**Oval flanges:** (Model FFP, refer to Data Sheet No. EDS6-10)  
Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 stainless steel.

**Equalizing valves:** (Model FFN, refer to Data Sheet No. EDS6-10)  
Available in Carbon steel or in 316 stainless steel and in pressure rating 16MPa or 42MPa.

**Hand-held communicator:** (Model FXW, refer to Data Sheet No. EDS 8-47)

**FOUNDATION™ fieldbus and Profibus™:** (Model: FDC, refer to Data Sheet No. EDSX5-85)

## ORDERING INFORMATION

When ordering this instrument, specify:

1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.  
Hold / Overscale (21.6mA) / Underscale (3.2mA)  
Unless otherwise specified, output hold function is supplied.
4. Output mode (linear or square root output)  
Unless otherwise specified, output mode is linear.
5. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
6. Tag No. (up to 26 alphanumerical characters), if required.

## CODE SYMBOLS

[illegible]

Note 1: (\*1) The thread is M12, if 42MPa {420bar} static pressure is specified.

Note 2: (\*2) 100: 1 turn down is possible, but should be used at the span greater than 1/40 of the maximum span for better performance.

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Digit No. of code
9	<Indicator and arrester> Indicator None Analog, 0 to 100% linear scale Analog, 0 to 100% sq. root scale Analog, custom scale Analog, double scale (Linear and sq. root) None Analog, 0 to 100% linear scale Analog, 0 to 100% sq. root scale Analog, custom scale Analog, double scale (Linear and sq. root) Digital, 0 to 100% Digital, custom scale Digital 0 to 100% square root Digital, 0 to 100% Digital, custom scale Digital 0 to 100% square root	Arrester None None None (*3) None None Yes Yes Yes (*3) Yes Yes None None None Yes Yes Yes		F	K	C				4	-							
		Note 3									A	B	C	D	J	E		
		Note 3									F	G	H	K	L	P	M	Q
											N							
10	<Approvals for hazardous locations (Approval pending)> None (for ordinary locations) RIIS, Flameproof (Conduit seal) (Available for 4th digit code "A", "S") RIIS, Flameproof (Cable gland seal) (Available for 4th digit code "A", "S") FM, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") CSA, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") ATEX, Flameproof RIIS, Intrinsic safety FM, Intrinsic safety and Nonincendive CSA, Intrinsic safety and Nonincendive ATEX, Intrinsic safety ATEX, Type n										A	B	C	D	E	X	G	H
											J	K	P					
11	<Vent/ drain and mounting bracket> Vent/drain Mounting bracket Standard None Standard Yes, stainless steel Side None Side Yes, stainless steel	Specify "A" or "C" for the 7th digit code "B", "L", or "U"									A	C	D	F				
12	<Options> Extra SS tag plate Stainless steel elec, housing Coating of cell None None None Yes None None None Yes None Yes (*4) Yes None None None Yes Yes None Yes None Yes Yes Yes Yes Yes	Note 4									Y	B	C	E	M	N	P	O
13	<Special applications and fill fluid> Treatment Fill fluid Standard Silicone oil Standard Fluorinated oil Degreasing Silicone oil Oxygen service Fluorinated oil (7th digit code "V" only) Chlorine service Fluorinated oil (7th digit code "H", "T", "B", "U") NACE specification Silicone oil (Not available for 7th digit code "T", "U" and 15th digit code "A", "B") Vacuum service Silicone oil for vacuum use										Y	W	G	A	D	N	R	
14	<Sensor O-ring / Gasket> Viton (O-ring) Teflon (gasket)																A	B
15	<Bolt/nut> (*8) Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut NACE bolt/nut (ASTM A193 B7M/A194 2HM) (*5) NACE bolt/nut (ASTM A320 L7M/A194 2HM) (*5) 304 stainless steel bolt/304 stainless steel nut (*6) 630 stainless steel bolt/304 stainless steel nut (*7)	Note 8 Note 5 Note 6 Note 7															A	B
																	C	D
																	E	F

Note 3: (\*3) In case of square root output mode, square root scale is not available.

Note 4: (\*4) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

Note 5: (\*5) Static pressure should be -0.1 to +10MPa{-1 to +100bar}.

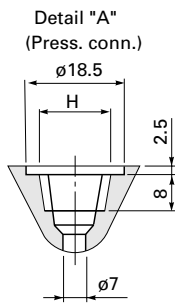
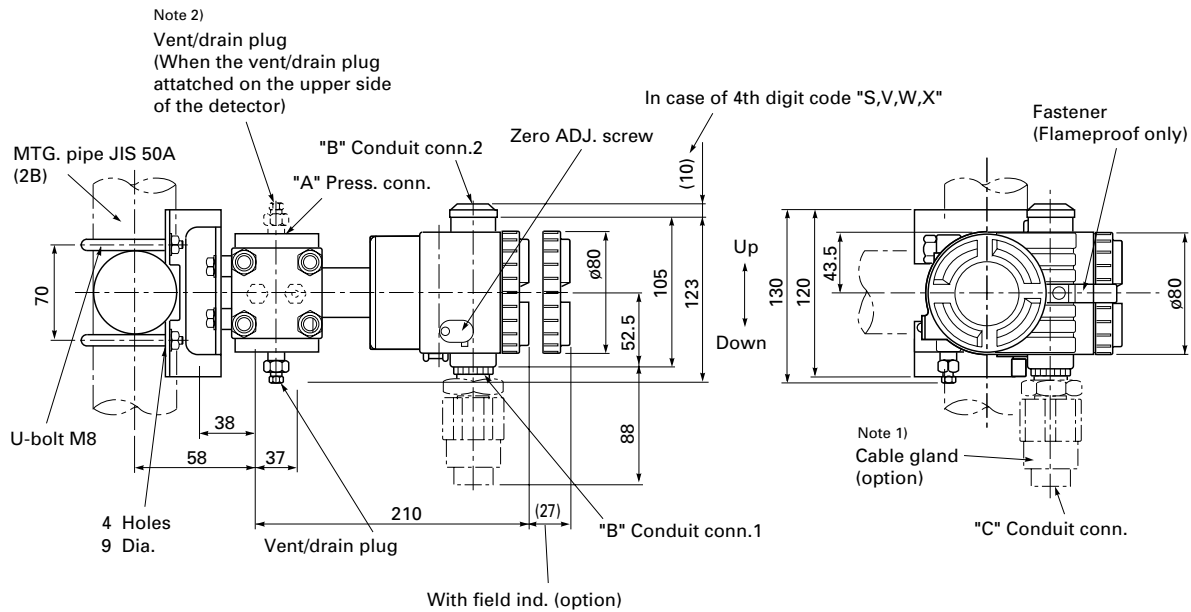
Note 6: (\*6) Available for 5th digit code "1", "2", "3". In case of stainless steel bolt with 5th digit code "3", static pressure should be -0.1 to +10MPa {-1 to + 100bar}.

Note 7: (\*7) Available for 5th digit code "3", "4".

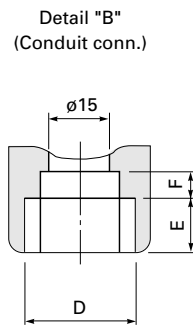
Note 8: (\*8) In case of tropical use, select stainless bolts and nuts.

# OUTLINE DIAGRAM (Unit:mm)

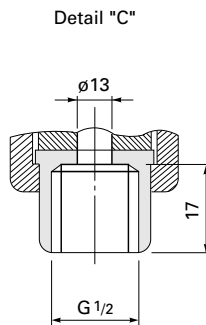
< 7th digit code : V, H, M, T >



See table 1



See table 1

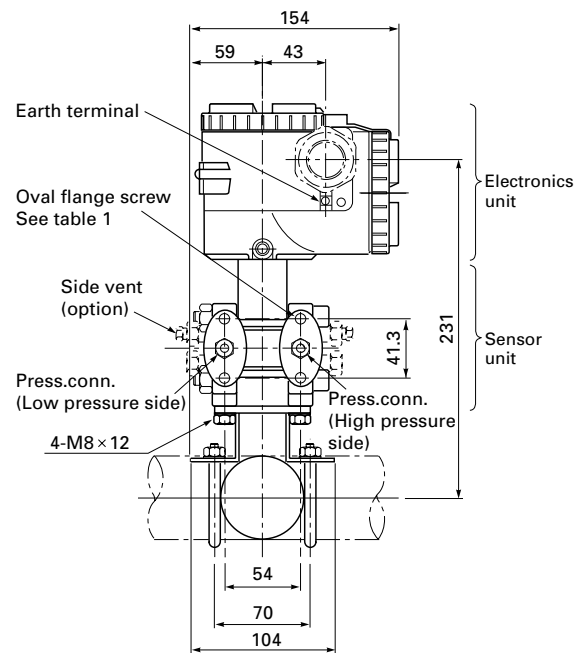


4th digit of the code symbols	Conduit conn.			Press. conn.	Oval flange screw
	D	E	F	H	
A, S	G <sup>1</sup> / <sub>2</sub>	17	8	Rc <sup>1</sup> / <sub>4</sub>	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth 15
B, T	<sup>1</sup> / <sub>2</sub> -14NPT	16	5	<sup>1</sup> / <sub>4</sub> -18NPT	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth 15
C, V	Pg13.5	8	4.5	<sup>1</sup> / <sub>4</sub> -18NPT	M10 Screw depth 15
D, W	M20×1.5	16	5	<sup>1</sup> / <sub>4</sub> -18NPT	M10 Screw depth 15
E, X	Pg13.5	8	4.5	<sup>1</sup> / <sub>4</sub> -18NPT	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth 15

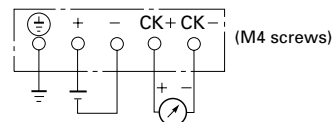
Table 1

Note 1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

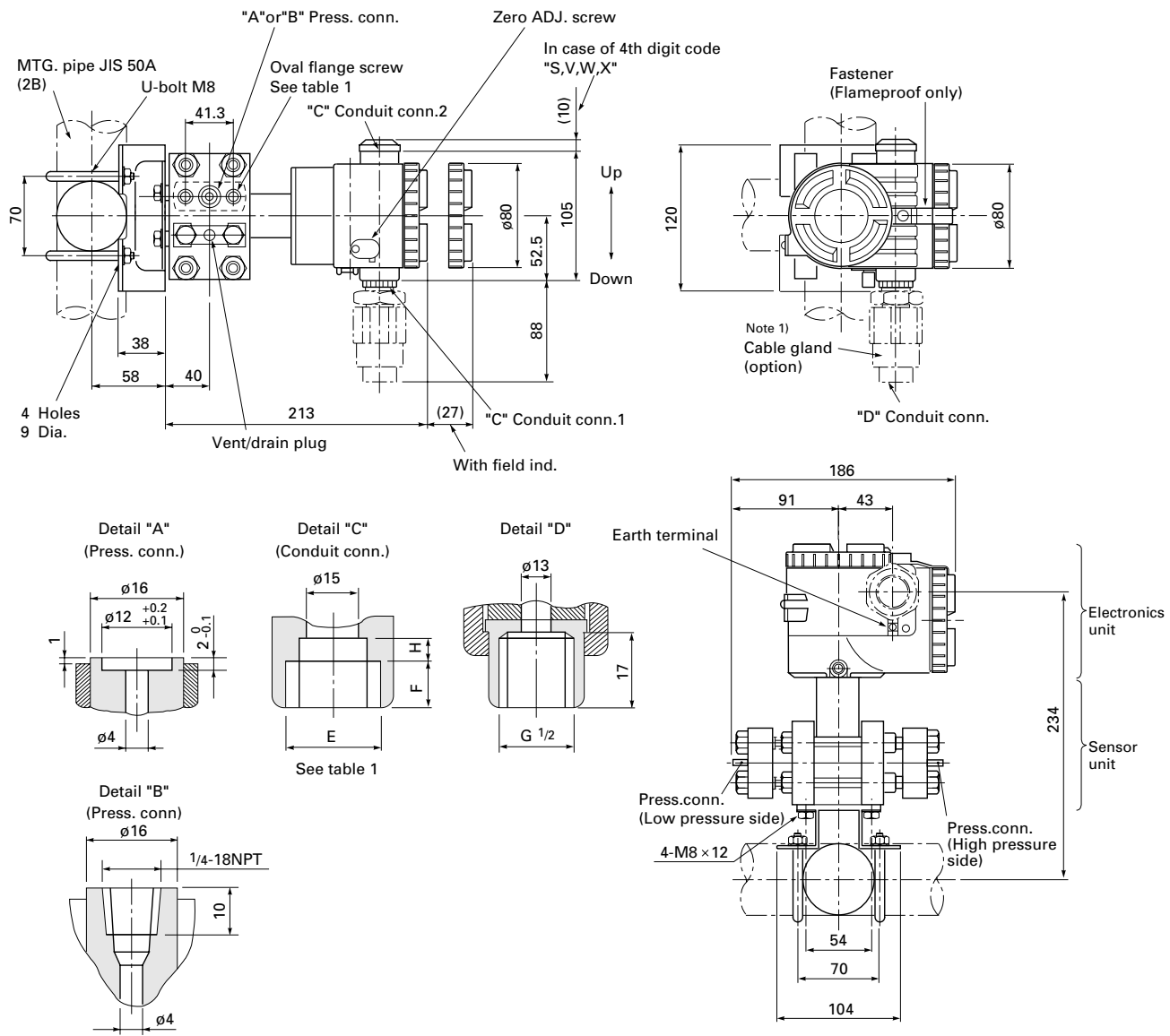
Note 2) The pressure connector is located on the down side surface of  
the detector, when the vent /drain plug is attached on the upper  
side of the detector.  
(When the 21th digit of the code symbols: C).



## CONNECTION DIAGRAM



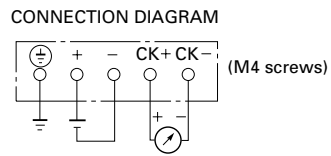
< 7th digit code : B, L, U >



4th digit of the code symbols	Conduit conn.			Oval flange screw
	E	F	H	
A, S	G 1/2	17	8	7/16-20UNF Screw depth 10
B, T	1/2-14NPT	16	5	7/16-20UNF Screw depth 10
C, V	Pg13.5	8	4.5	M10 Screw depth 10
D, W	M20×1.5	16	5	M10 Screw depth 10
E, X	Pg13.5	8	4.5	7/16-20UNF Screw depth 10

Table 1

Note 1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.



The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

**EMI (Emission) EN61326 : 1997**  
**Class A (standard for Industrial Location)**

Frequency range MHz	Limits	Reference standard
30 to 230	40dB ( $\mu\text{V}/\text{m}$ ) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB ( $\mu\text{V}/\text{m}$ ) quasi peak, measured at 10m distance	

**EMI (Immunity) EN61326: 1997**  
**Annex A (standard for Industrial Location)**

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4kV (Contact) 8kV (Air)	IEC61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	IEC61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	IEC61000-4-8	A
Burst	2kV 5kHz	IEC61000-4-4	A
Surge	1.2 $\mu\text{s}$ /50 $\mu\text{s}$ 1kV (Line to line) 2kV (Line to ground)	IEC61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	IEC61000-4-6	B

**Note) Definition of performance criteria**

**A: During testing, normal performance within the specification limits.**

**B: During testing, temporary degradation, or loss of function or performance which is self-recovering.**

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 Fax: 81-42-585-6187  
<http://www.fic-net.co.jp>

# LEVEL TRANSMITTER

## DATA SHEET

**FKE...4**

The FCX-AII level transmitter accurately measures liquid level and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

## FEATURES

### 1. High accuracy

0.2% accuracy for all calibrated spans is a standard feature for all models covering 0.32kPa{3.2mbar} range to 500kPa{5bar} high differential pressure range. 0.1% accuracy is available as option. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.

### 2. Minimum environmental influence

The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, static pressure, and overpressure substantially reduces total measurement error in actual field applications.

### 3. Fuji/HART® bilingual communications protocol and FOUNDATION™ fieldbus and Profibus™ compatibility

FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII.

Further, by upgrading electronics FOUNDATION™ fieldbus and Profibus™ are also available.

### 4. Application flexibility

Various options that render the FCX-AII suitable for almost any process applications include:

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5-digit LCD meter with engineering unit
- Stainless steel electronics housing
- Wide selection of materials
- High temperature, high vacuum service.

### 5. Programmable output Linearization Function

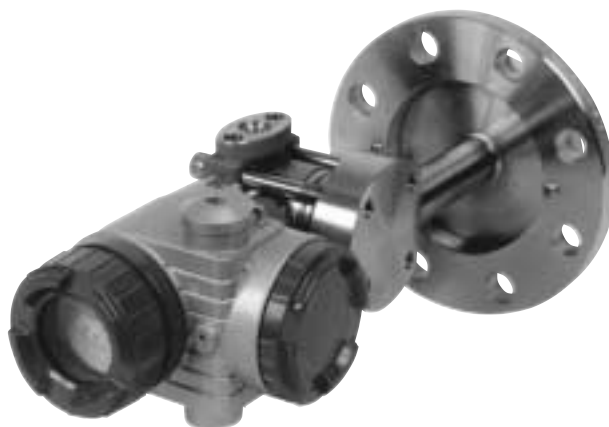
Output signal can be freely programmable.  
(Up to 14 compensated points at approximation.)

### 6. Burnout current flexibility (Under Scale: 3.2 to 3.8mA, Over Scale: 20.8 to 21.6mA)

Burnout signal level is adjustable using Model FXW Hand Held Communicator (HHC) to comply with NAMUR NE43.

### 7. Dry calibration without reference pressure

Thanks to the best combination of unique construction of mechanical parts (Sensor unit) and high performance electronics circuit (Electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.



## SPECIFICATIONS

### Functional specifications

**Service:** Liquid, gas, or vapour  
**Static pressure, span, and range limit:**

Type	Static pressure	Span limit [kPa] {m bar}		Range limit [kPa] {m bar}
		Min.	Max.	
FKE□□3	Up to flange rating	0.32	32	+/- 32
		{3.2}	{320}	{ +/- 320}
FKE□□5		1.3	130	+/- 130
		{13}	{1300}	{ +/- 1300}
FKE□□6		5	500	+/- 500
		{50}	{5000}	{ +/- 5000}

Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

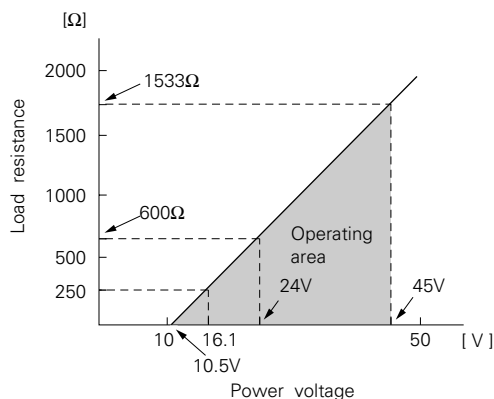
- Lower limit of static pressure (vacuum limit) ;  
Silicone fill sensor: See Fig.1  
Fluorinated fill sensor: 66kPa abs (500mmHg abs) at temperature below 60 °C.
- The maximum span of each sensor can be converted to different units using factors as below.  
 $1\text{MPa}=10^3\text{kPa}=10\text{bar}=10.19716\text{kgf/cm}^2=145.0377\text{psi}$   
 $1\text{kPa}=10\text{mbar}=101.9716\text{mmH}_2\text{O}=4.01463\text{inH}_2\text{O}$

**Overrange limit:** To maximum static pressure limit

**Output signal:** 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal

**Power supply:** Transmitter operates on 10.5V to 45V DC at transmitter terminals.  
10.5V to 32V DC for the units with optional arrester.

Load limitations: see figure below



Note: For communication with HHC<sup>(1)</sup> (Model: FXW), min. of 250Ω required.

#### Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6	Ex II 1 GD - EExia IIC T4/T5	Ex II 3 GD - EExn IIC T4/T5
Factory Mutual	Class I II III Div. 1	Class I II III Div. 1	Class I II III Div. 2
CSA	Groups B thru. G Class I II III Div. 1	Groups A thru. F Class I II III Div. 1	Groups A thru. G Class I II III Div. 2
RIIS	Groups C thru. G Ex do IIB+H <sub>2</sub> T4	Groups A thru. G Ex ia IIC T4	Groups A thru. G

#### Zero/span adjustment:

Zero and span are adjustable from the HHC<sup>(1)</sup>. Zero is also adjustable externally from the adjustment screw.

#### Damping:

Adjustable from HHC.  
The time constant is adjustable between 0 to 32 seconds.

#### Zero elevation/suppression:

– 100% to + 100% of URL

#### Normal/reverse action:

Selectable from HHC<sup>(1)</sup>

**Indication:** Analog indicator or 5-digit LCD meter, as specified.

**Burnout direction:** Selectable from HHC<sup>(1)</sup>

If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

"Output Hold":

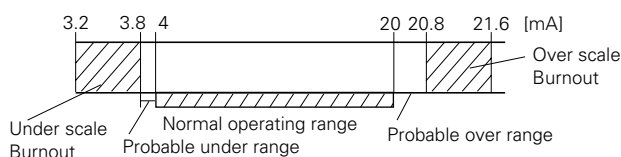
Output signal is hold as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.8mA to 21.6mA from HHC<sup>(1)</sup>

"Output Underscale":

Adjustable within the range 3.2mA to 3.8mA from HHC<sup>(1)</sup>



#### Loop-check output:

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC<sup>(1)</sup>.

#### Temperature limit:

Ambient: – 40 to + 85°C

(– 20 to + 80°C for LCD indicator)

(– 40 to + 60°C for arrester option)

(– 10 to + 60°C for fluorinated oil fill transmitter)

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified in each standard.

#### Process:

	Code in the 13th digit of "Code symbols"	Process temperature	Lower limit of static press
Fluorinated oil	W, A and D	–20 to 120°C	Atmospheric pressure
Silicone oil	H	–15 to 250°C	
	J	85 to 300°C	
	Y and G	–40 to 120°C	2.7kPa abs (20.3mmHg abs)
	S	–15 to 250°C	
	T	85 to 300°C	
	K	–15 to 150°C	0.13kPa abs (0.98mmHg abs)

Low pressure side contact liquid temperature on transmitter of Code H, J, S, T is 120°C or lower. Low pressure side contact liquid temperature of Code K is 85°C or lower

Storage: – 40 to + 90°C

**Humidity limit:** 0 to 100% RH

**Communication:** With HHC<sup>(1)</sup> (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note: HHC's version must be more than 6.0 (or FXW□□□□1–□3), for FCX-A II.

Items	Display	Set
Tag No.	√	√
Model No.	√	√
Serial No.	√	—
Engineering unit	√	√
Range limit	√	—
Measuring range	√	√
Damping	√	√
Output mode	√	—
Burnout direction	√	√
Calibration	√	√
Output adjust	—	√
Data	√	—
Self diagnoses	√	—
Printer	—	—
External switch lock	√	√
Transmitter display	√	√
Linearize	√	√
Rerange	√	√

#### Programmable output linearization function:

Output signal can be characterized with "14 points linear approximation function" from HHC<sup>(1)</sup>.

## Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4-20 mA analog output in linear mode.

**Accuracy rating:** (including linearity, hysteresis, and repeatability)

(Standard)

For spans greater than  $\frac{1}{10}$  of URL:  $\pm 0.2\%$  of span

For spans below  $\frac{1}{10}$  of URL:

$$\pm \left( 0.1 + 0.1 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

(Option) (Code: 21th digit H, K)

For span greater than  $\frac{1}{10}$  of URL:  $0.1\%$  of span

For span below  $\frac{1}{10}$  of URL:

$$\pm \left( 0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

**Stability:**  $\pm 0.2\%$  of upper range limit (URL) for 3 years

**Temperature effect:**

Effects per  $28^\circ\text{C}$  change between the limits of  $-40^\circ\text{C}$  and  $+85^\circ\text{C}$

(Standard) Zero shift:  $\pm 0.35\%$  of URL

Total effect:  $\pm 0.5\%$  of URL

(Option) (Code: 21th digit J, K)

Zero shift:  $\pm 0.3\%$  of URL

Total effect:  $\pm 0.4\%$  of URL

**Static pressure effect:**

Zero shift:  $\pm 0.2\%$  of URL / 1MPa

Span shift:  $-0.2\%$  of calibrated span / 1MPa

**Overrange effect:** Zero shift;  $\pm 0.1\%$  of URL for flange rating pressure

**Supply voltage effect:**

Less than  $0.005\%$  of calibrated span per 1V

**RFI effect:**

Less than  $0.2\%$  of URL for the frequencies of 20 to 1000MHz and field strength 30 V/m when electronics covers on.

(Classification: 2-abc:  $0.2\%$  span per SAMA PMC 33.1)

**Step response:** (without electrical damping)

Range code	Time constant *)	Dead time *)
"3"	0.55 s	0.2 s
"5" and "6"	0.3 s	

\*) Faster response is available as option (maximum update rate : 25 times per second)

**Mounting position effect:**

Zero shift, less than  $0.3\text{kPa}$  (3m bar) for a  $10^\circ$  tilt in any plane. (No extension)

No effect on span.

This error can be corrected by adjusting zero.

**Dielectric strength:**

500V AC, 50/60Hz 1 min., between circuit and earth.

**Insulation resistance:**

More than  $100\text{M}\Omega$  at 500V DC.

**Turn-on time:** 4 sec

**Internal resistance for external field indicator:**

$12\Omega$  or less

## Physical specifications

**Electrical connections:**

$G\frac{1}{2}$ ,  $\frac{1}{2}$ -14 NPT, Pg13.5, or M20 x 1.5 conduit, as specified.

And 1-conduit or 2-conduit, as specified.

**Process connections:**

LP side:  $\frac{1}{4}$ -18 NPT or Rc $\frac{1}{4}$ .

HP side: ANSI, DIN, or JIS raised face flange. See OUTLINE DIAGRAM for detailed dimensions.

Refer to "Code symbols"

**Process-wetted parts material:**

Material code (7th digit in "Code symbols")	LP side			HP side
	Process cover	Diaphragm	Wetted sensor body	Diaphragm & flange face
V	316 stainless	316L stainless	316 stainless	316L stainless
J	316 stainless	316L stainless	316 stainless	316L stainless steel +Au coating
C	316 stainless	316L stainless	316 stainless	Hastelloy-C
D	316 stainless	316L stainless	316 stainless	Monel
E	316 stainless	316L stainless	316 stainless	Tantalum
H	316 stainless	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
M	316 stainless	Monel	Monel lining	Monel
T	316 stainless	Tantalum	Tantalum lining	Tantalum
B	Hastelloy-C	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum	Tantalum	Tantalum lining	Hastelloy-C
P	316 stainless	316L stainless	316 stainless	Tantalum
R	316 stainless	316L stainless	316 stainless	Zirconium

**Non-wetted parts material:**

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.

Bolts and nuts: Cr-Mo alloy (standard) or 304 stainless steel

Fill fluid: Silicone oil (standard) or fluorinated oil

Mounting flange: 304 stainless steel or Carbon steel, as specified

**Environmental protection:**

IEC IP67 and NEMA 6 / 6P

**Flange mounting:** See drawings

**Mass(weight):** Transmitter approximately 13kg without options.

Add; 0.5kg for mounting bracket

0.8kg for indicator option

4.5kg for stainless steel housing option

1.0kg per 50mm extension of diaphragm

### Optional features

- Indicator:** A plug-in analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.  
An optional 5-digit LCD meter with engineering unit is also available.
- Arrester:** A built-in arrester protects the electronics from lightning surges.  
Lightning surge immunity:  
4kV ( $1.2 \times 50\mu\text{s}$ )
- Oxygen service:** Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.  
The fill fluid is fluorinated oil.
- Chlorine service:** Oil-free procedures as above. Includes fluorinated oil for fill.
- Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.
- Vacuum service:** Special silicone oil and filling procedure are applied. See Fig.1 and Fig.2
- Optional tag plate:**  
An extra stainless steel tag with customer tag data is wired to the transmitter.

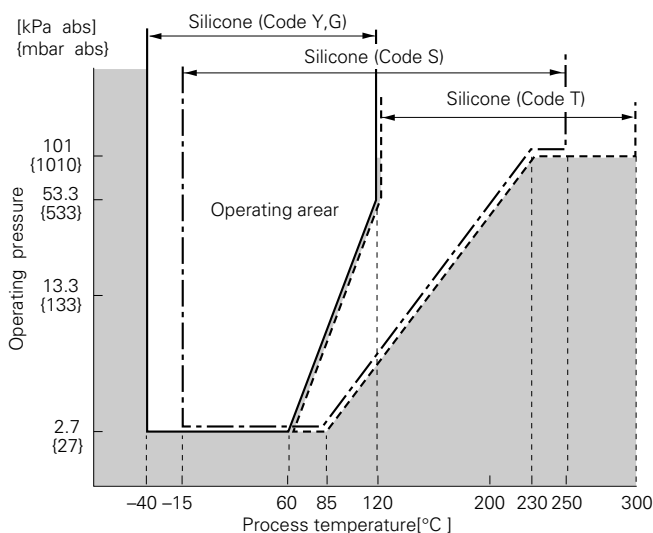


Fig. 1 Relation between process temperature and operating pressure

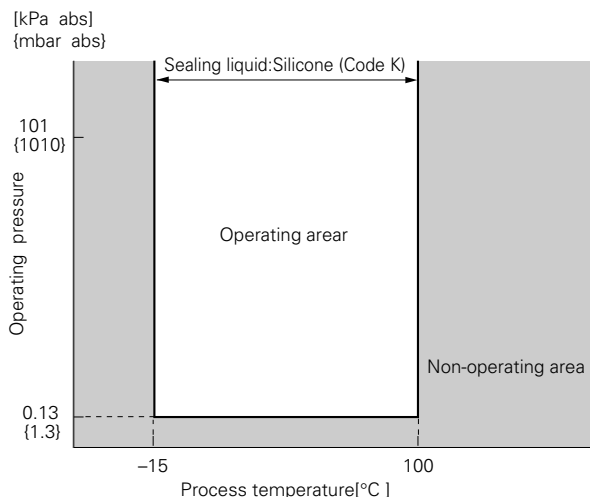


Fig. 2 Relation between process temperature and operating pressure

**Coating of cell:** Cell's surface is finished with epoxy/polyurethane double coating.  
Specify if environment is extremely corrosive.

## ACCESSORIES

- Oval flanges:** (Model FFP, refer to Data Sheet No. EDS6-10)  
Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 stainless steel.
- Hand held communicator:**  
(Model FXW, refer to Data Sheet No. EDS 8-47)
- FOUNDATION™ fieldbus and Profibus™:**  
(Model: FDE, refer to Data Sheet No. EDSX5-85)

## ORDERING INFORMATION

When ordering this instrument, specify:

1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.  
Hold / Overscale (21.6mA) / Underscale (3.2mA).  
Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
5. TAG No. (up to 26 alphanumerical characters), if required.

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

**EMI (Emission) EN61326 : 1997**  
**Class A (standard for Industrial Location)**

Frequency range MHz	Limits	Reference standard
30 to 230	40dB ( $\mu\text{V/m}$ ) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB ( $\mu\text{V/m}$ ) quasi peak, measured at 10m distance	

**EMI (Immunity) EN61326: 1997**  
**Annex A (standard for Industrial Location)**

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4kV (Contact) 8kV (Air)	IEC61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	IEC61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	IEC61000-4-8	A
Burst	2kV 5kHz	IEC61000-4-4	A
Surge	1.2 $\mu\text{s}/50\mu\text{s}$ 1kV (Line to line) 2kV (Line to ground)	IEC61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	IEC61000-4-6	B

**Note) Definition of performance criteria**

**A: During testing, normal performance within the specification limits.**

**B: During testing, temporary degradation, or loss of function or performance which is self-recovering.**

# CODE SYMBOLS

Digit	Description			Note	1	2	3	4	5	6	7	8	9 10 11 12 13					14 15		21	← Digit No. of code
4	<Connections>				F	K	E														
	Process connection	Oval flange screw	Conduit connection																		
	Rc1/4	7/16-20UNF	G 1/2 (×1)					A													
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×1)					B													
	1/4-18NPT	M10	Pg13.5 (×1)					C													
	1/4-18NPT	M10	M20×1.5 (×1)					D													
	1/4-18NPT	7/16-20UNF	Pg13.5 (×1)					E													
	Rc1/4	7/16-20UNF	G 1/2 (×2)					S													
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×2)					T													
	1/4-18NPT	M10	Pg13.5 (×2)					V													
1/4-18NPT	M10	M20×1.5 (×2)					W														
1/4-18NPT	7/16-20UNF	Pg13.5 (×2)					X														
5	<Mounting flange>																				
	Material	Size and rating																			
	304 stainless steel	JIS 10K 80A							0												
		JIS 10K 100A							1												
		JIS 30K 80A							2												
		JIS 30K 100A							3												
		ANSI/JPI 150LB 3"							4												
		ANSI/JPI 150LB 4"							5												
		ANSI/JPI 300LB 3"							6												
		ANSI/JPI 300LB 4"							7												
		DIN PN40 DN80							8												
		DIN PN16 DN100							9												
	Carbon steel	JIS 20K 80A							M												
		ANSI/JPI 600LB 3B							R												
		JIS 10K 80A							A												
		JIS 10K 100A							B												
		JIS 30K 80A							C												
		JIS 30K 100A							D												
		ANSI/JPI 150LB 3"							E												
		ANSI/JPI 150LB 4"							F												
ANSI/JPI 300LB 3"							G														
ANSI/JPI 300LB 4"							H														
316 stainless steel	DIN PN40 DN80		Note 1					J													
	DIN PN16 DN100							K													
	JIS 10K 80A							S													
	ANSI/JPI 150LB 3B							T													
	ANSI/JPI 150LB 4B							U													
	ANSI/JPI 300LB 3B							V													
	ANSI/JPI 300LB 4B							W													
	ANSI/JPI 600LB 3B							X													
6	<Span limit (*1) [kPa] {m bar}>																				
	0.32 ----32																				
	{3.2 ----320}																				
	1.3 ----130																				
	{13 -----1300}																				
	5 -----500																				
	{50 -----5000}																				
7	<Material>																				
	LP side			HP side																	
	Process cover	Diaphragm	Wetted sensor body	Diaphragm and flange face																	
	316 stainless steel	316L stainless steel	316 stainless steel	316L stainless steel																	
	316 stainless steel	316L stainless steel	316 stainless steel	Hastelloy-C																	
	316 stainless steel	316L stainless steel	316 stainless steel	Monel																	
	316 stainless steel	316L stainless steel	316 stainless steel	Tantalum																	
	316 stainless steel	316L stainless steel	316 stainless steel	Diaphragm:																	
				316L stainless steel																	
				+Au coating																	
				Flange:																	
				316L stainless steel																	
	316 stainless steel	Hastelloy-C	Hastelloy-C lining	Hastelloy-C																	
	316 stainless steel	Monel	Monel lining	Monel																	
	316 stainless steel	Tantalum	Tantalum lining	Tantalum																	
	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C																	
Monel lining	Monel	Monel lining	Monel	Note 3																	
Tantalum lining	Tantalum	Tantalum lining	Tantalum	Note 2, 3																	
316 stainless steel	316L stainless steel	316 stainless steel	Titanium																		
316 stainless steel	316L stainless steel	316 stainless steel	Zirconium																		

Note 1: (\*1) 100: 1 turn down is possible, but should be used at a span greater than 1/40 of the maximum span for better performance.

Note 2: (\*2) Material Code R; 6th digit code "6" is not available.

Note 3: (\*3) 5th digit code "0, 2, 4, 6, 8, A, C, E, G, J" are available.

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21	Digit No. of code
9	<Indicator and arrester> Indicator None Analog, 0 to 100% linear scale Analog, custom scale None Analog, 0 to 100% linear scale Analog, custom scale Digital, 0 to 100% Digital, custom scale Digital, 0 to 100% Digital, custom scale	Arrester None None None Yes Yes Yes None None Yes Yes	F	K	E					4	-								
10	<Approvals for hazardous locations (Approval pending)> None (for ordinary locations) RIIS, Flameproof (Conduit seal) (Available for 4th digit code "A", "S") RIIS, Flameproof (Cable gland seal) (Available for 4th digit code "A", "S") FM, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") CSA, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") ATEX, Flameproof RIIS, Intrinsic safety FM, Intrinsic safety and nonincendive CSA, Intrinsic safety and nonincendive ATEX, Intrinsic safety ATEX, Type n										A B C D E F H L P Q S								
11	<Diaphragm extension [mm]> <u>Extension [mm]</u> <u>Applicable material code</u> 0      Any 50 100 150      } (7th digit code "V" only) 200 50 100      } (7th digit code "H", "B", "C" only) 150 200										Y A B C D E F G H								
12	<Options> <u>Extra SS tag plate</u> <u>Stainless steel elec. housing</u> <u>Coating of cell</u> None      None      None Yes      None      None None      Yes      None Yes      (* 4)      Yes      None      Note 4 None      None      Yes Yes      None      Yes None      Yes      Yes Yes      Yes      Yes										Y B C E M N P Q								
13	<Special applications and fill fluid> <u>Treatment</u> <u>Fill fluid</u> Standard      Silicone oil Standard      Fluorinated oil Degreasing      Silicone oil Oxygen service      Fluorinated oil (7th digit code "V" only) Chlorine service      Fluorinated oil (7th digit code "H", "T", "B" and "U") High temp. 250°C      7th digit code "V", "H", "B" High temp. 300°C      } High temp. and vacuum (250°C)      7th digit code "V"      (* 5) Note 5 High temp. and vacuum (300°C)      } High temp. and high vacuum      Silicone oil      }										Y W G A D H J S T K								
14	<O-ring, gasket and Teflon membrane> <u>O-ring /Gasket</u> <u>Teflon membrane</u> Viton (O-ring)      None Teflon (gasket)      None Viton (O-ring)      Yes } (5th digit code "0", "2", "4", "6", "8", "A", "C", "E", Teflon (gasket)      Yes } "G", "J", and 11th digit code "Y" are available. 13th digit code "H, J, S, T, K" are not available.)															A B C D			
15	<Bolt/nut> (* 6) Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut 304 stainless steel bolt /304 stainless steel nut	Note 6															A B E		
21	<Other options> High accuracy type Low temperature effect type H+J																	H J K	

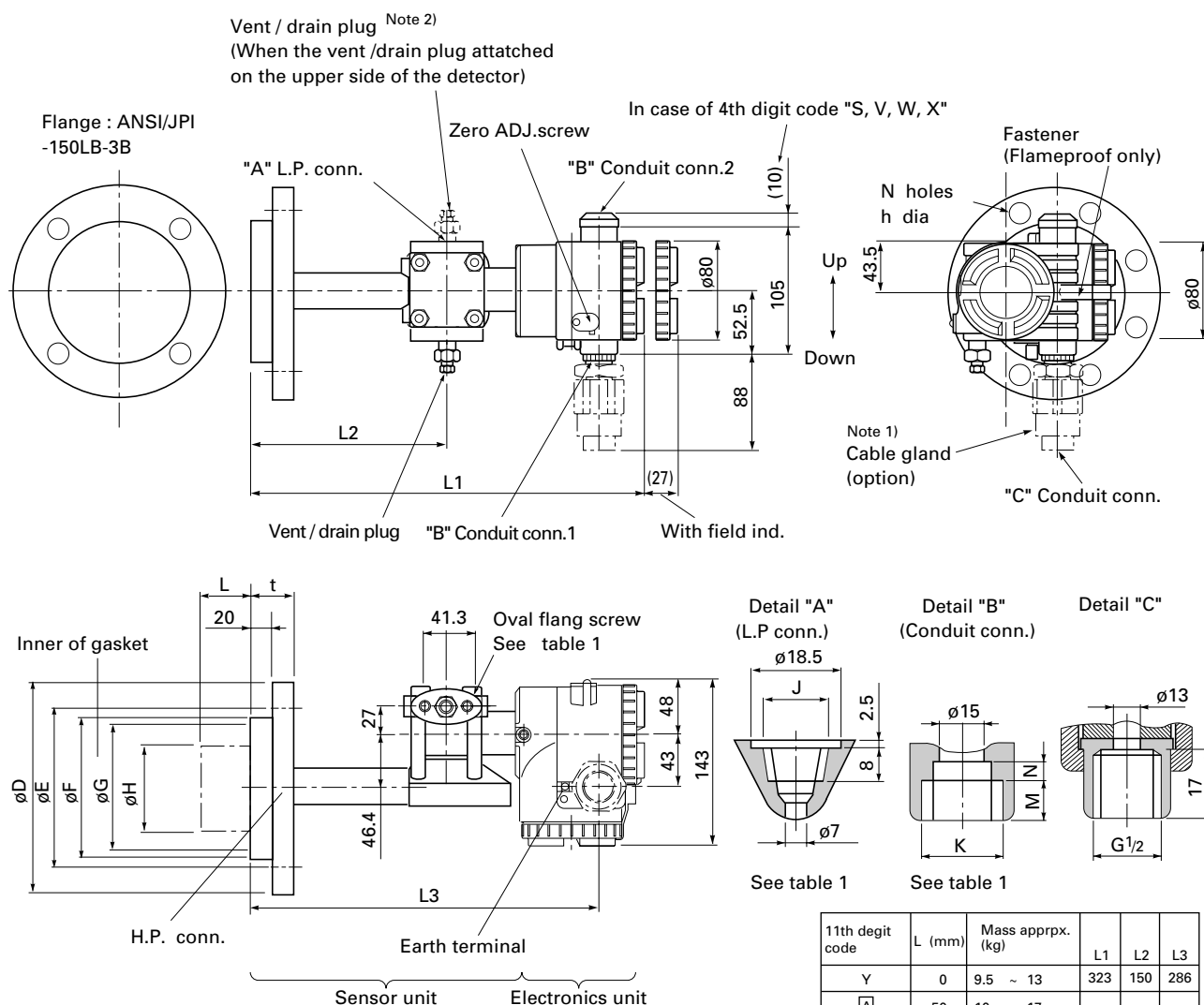
Note 4: (\*4) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes"

Note 5: (\*5) Treatment; None

Note 6: (\*6) In case of tropical use, select stainless bolts and nuts.

# OUTLINE DIAGRAM (Unit:mm)

< 7digit code : Without "B", "L" and "U" >



øD	øE	øF	øG	øH	t	N-øh	(Flange)
185	150	126	100	73	38	8-19	JIS-10K-80A
210	175	151	103	96	38	8-19	JIS-10K-100A
210	170	126	100	73	48	8-23	JIS-30K-80A
240	195	151	103	96	52	8-25	JIS-30K-100A
191	152.5	126	100	73	44	4-20	ANSI/JPI-150LB-3B
229	190.5	151	103	96	44	8-20	ANSI/JPI-150LB-4B
210	168	126	100	73	49	8-23	ANSI/JPI-300LB-3B
254	200	151	103	96	52	8-23	ANSI/JPI-300LB-4B
200	160	126	100	73	44	8-18	DIN PN40 DN80
220	180	151	103	96	40	8-18	DIN PN16 DN100

11th digit code	L (mm)	Mass apprx. (kg)	L1	L2	L3
Y	0	9.5 ~ 13	323	150	286
A	50	10 ~ 17	317	144	290
B	100	10.5 ~ 17.5			
C	150	11 ~ 18			
D	200	11.5 ~ 18.5			

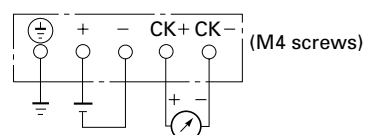
4th digit of the code symbols	Conduit conn.			Press.conn.	Oval flange screw
	K	M	N		
A, S	G <sup>1</sup> / <sub>2</sub>	17	8	Rc <sup>1</sup> / <sub>4</sub>	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth15
B, T	<sup>1</sup> / <sub>2</sub> -14NPT	16	5	<sup>1</sup> / <sub>4</sub> -18NPT	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth15
C, V	Pg13.5	8	4.5	<sup>1</sup> / <sub>4</sub> -18NPT	M10 Screw depth15
D, W	M20×1.5	16	5	<sup>1</sup> / <sub>4</sub> -18NPT	M10 Screw depth15
E, X	Pg13.5	8	4.5	<sup>1</sup> / <sub>4</sub> -18NPT	<sup>7</sup> / <sub>16</sub> -20UNF Screw depth15

Table 1

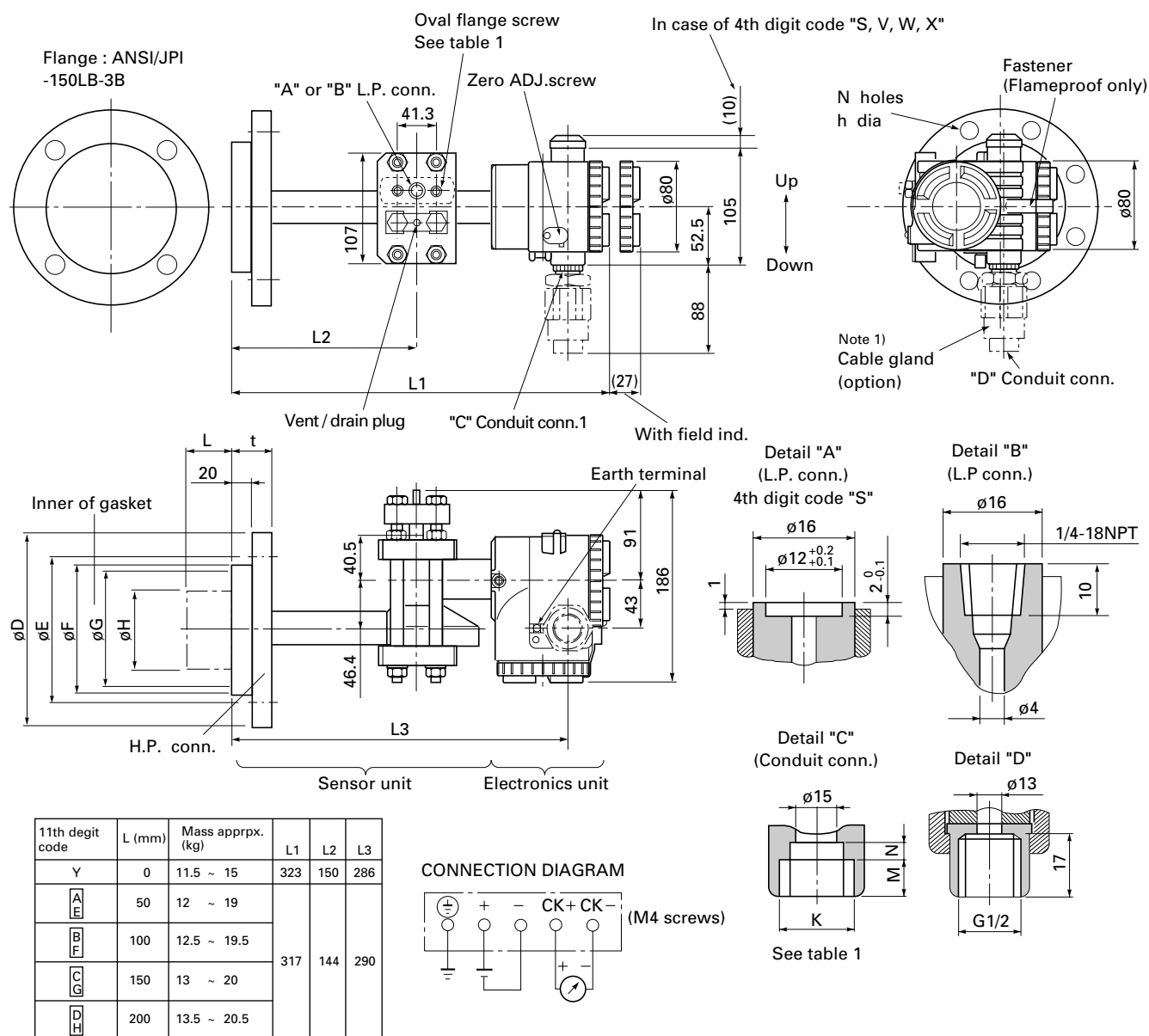
Note 1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

Note 2) The pressure connector is located on the down side surface of the detector, when the vent / detector  
(When the 21th digit of the code symbols : C).

## CONNECTION DIAGRAM



< 7th digit code : "B", "L" or "U" >



Note 1) Cable gland is supplied in case of 10th digit code "C".  
 ø11 cable is suitable.

Table 1

4th digit of the code symbols	Conduit conn.			Oval flange screw
	K	M	N	
A, S	G $\frac{1}{2}$	17	8	$\frac{7}{16}$ -20UNF Screw depth10
B, T	$\frac{1}{2}$ -14NPT	16	5	$\frac{7}{16}$ -20UNF Screw depth10
C, V	Pg13.5	8	4.5	M10 Screw depth10
D, W	M20 $\times$ 1.5	16	5	M10 Screw depth10
E, X	Pg13.5	8	4.5	$\frac{7}{16}$ -20UNF Screw depth10

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